INDIA RUBBER WORLD

OUR 65th YEAR

A BILL BROTHERS PUBLICATION

APRIL, 1954

CABOT, World's only
CARBON BLACK Manufacturer of
A COMPLETE RANGE of
CHANNEL, FURNACE
and
THERMAL
BLACKS
CABOT
Sterling® FT
(FINE THERMAL)
Sterling® MT
(MEDIUM THERMAL)
Sterling® MT Non Staining
(MEDIUM THERMAL NON-STAINING)
● Consult your nearest Cabot agent for mixed carloads and truckloads, from a single Cabot plant location, of the combination of thermal and other grades of blacks for rubber you require . . .
GODFREY L. CABOT, INC.
BOSTON 10, MASS.

TABLE OF CONTENTS ON PAGE 51

Du Pont's Versatile Antioxidant Family

For protection against normal aging, heat aging, and flex failure, use . . .

Antox®

BUTYRALDEHYDE-ANILINE CONDENSATION PRODUCT

A liquid antioxidant that is very soluble in dry elastomers and can be easily emulsified for use in latex. It provides outstanding protection against normal aging and frosting, causes a low order of discoloration, and activates acidic accelerators in GR-S and natural rubber, giving high modulus and tensile values.

Neozone® D

PHENYL-BETA-NAPHTHYLAMINE

Neozone® A

PHENYL-ALPHA-NAPHTHYLAMINE

The most popular, tried and proven economical, general-purpose antioxidants. They provide adequate protection for most applications against normal aging, heat deterioration and flex cracking. Use *Neozone* A where very high antioxidant solubility is desired.

Akroflex® CD

PHENYL-BETA-NAPHTHYLAMINE AND DIPHENYL-PARA-PHENYLENEDIAMINE

A high-quality, antioxidant mixture that provides outstanding ozone resistance in neoprene and excellent protection against heat degradation and normal aging in all elastomers. It is second only to *Thermoflex* A in its protection against flex fatigue.

Thermoflex® A

PHENYL-BETA-NAPHTHYLAMINE, DI-PARA-METHOXYDIPHENYLAMINE AND DIPHENYL-PARA-PHENYLENEDIAMINE

A tailor-made antioxidant mixture, specifically designed to give outstanding protection against normal aging, heat degradation and particularly flex fatigue in all elastomers. It also provides excellent protection against ozone degradation in neoprene. ***Thermoflex* A is the top-quality antioxidant for flex resistance and over-all protection of all types of elastomers.**

District Offices:

Akron 8, Ohio, 40 E. Buchtel Ave. . POrtage 2-8461
Atlanta, Ga., 1261 Spring St., N. W. EMerson 5391
Boston 5, Mass., 140 Federal St. . HAncock 6-1711
Chicago 3, Ill., 7 South Dearborn St. ANdover 3-7000
Detroit 35, Mich., 13000 West 7-Mile Rd. UNiversity 4-1963
Houston 4, Texas, 4141 Dennis St. . . ATwood 4565
Los Angeles 58, Cal., 2930 E. 44th St LOgan 5-6464
New York 13, N. Y., 40 Worth St. COrtlandt 7-3966
Wilmington 98, Del., 1007 Market St. Wilm. 4-5121

DU PONT RUBBER CHEMICALS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

India Rubber World, April, 1954, Vol. 130, No. 1. Published monthly by Bill Brothers Publishing Corp. Office of Publication, 1309 Noble Street, Philadelphia, Pa., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States and Mexico, $5.00 per year; Canada, $6.00; All other Countries $7.00; Single Copies 50 cents. Address Mail to N. Y. Office.

News about

B. F. Goodrich Chemical *raw materials*

extra advantages with these 3 OUTSTANDING PLASTICIZERS *for Hycar nitrile rubbers*

THESE three plasticizers are designed to improve processing *and* end products. Check over their many advantages and see how they can benefit your operations. For further information, please write Dept. HA-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco In Canada: Kitchener, Ontario.

Good-rite GP-261

A balanced dioctyl phthalate plasticizer which offers many advantages over lower phthalate types at essentially no increase in cost. It is less volatile—provides better retention of physical properties in high temperature service. It also provides improved tensile strength and elongation with no sacrifice in hardness, compression set or oil resistance.

Good-rite GP-233

A dioctyl adipate which is outstanding for low temperature applications. Its volatility is low and its efficiency high. It has good processing characteristics.

Hycar 1312

A liquid nitrile polymer which is an excellent non-migrating, non-extractable, non-volatile polymeric-type plasticizer. Hycar 1312 improves the flow, extrusion and calendering properties of stocks and produces compounds with excellent roll building and knitting characteristics.

Relatively small amounts of Hycar 1312 reduce the viscosity of uncured compounds. This effect approaches peptization and is useful in production of sponge, friction compounds and other operations.

Hycar Reg. U. S. Pat. Off. *American Rubber*

Good-rite Reg. U. S. Pat. Off. CHEMICALS

B. F. Goodrich Chemical Company

A Division of The B. F. Goodrich Company

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

We'd like to tell you more about how we serve our Philblack* customers and prospective customers.

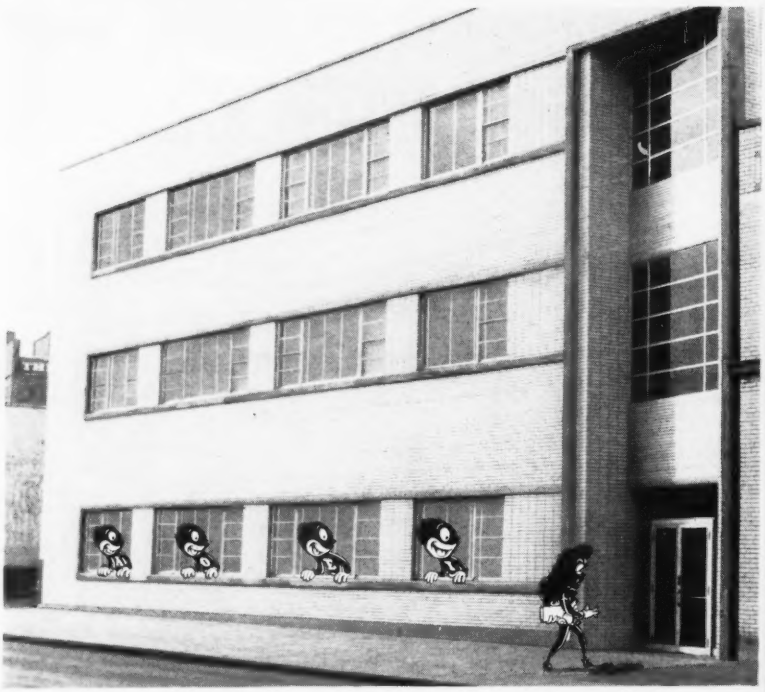
Our Sales Service Laboratory in Akron is a good example. We have an outstanding backlog of experience with carbon black in rubber compounds. We've struggled with more problems than you might guess. We've come up with plenty of sound, workable solutions, too.

Of course, we don't know all the answers . . . who does? But we are eager to tackle the troubles you may be having in your plant right now with some old or new application of carbon black and rubber.

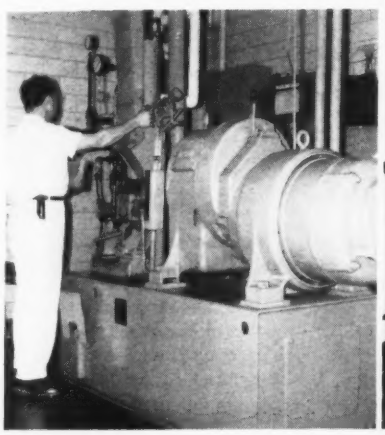
This is your invitation to benefit from our unmatched experience with oil furnace blacks in rubber compounds. We are glad to make available to you the considerable resources and ingenuity you'll find in our Philblack Sales Service Laboratory.

We suggest you discuss your problems with our technical representative or write Phillips Chemical Company, 318 Water Street, Akron 5, Ohio.

*A TRADEMARK



First floor at 318 Water Street, Akron, is a customer service laboratory devoted to helping customers get the most out of Philblack in present and proposed applications. Upper floors house Philblack Sales personnel and a laboratory for studies on the fundamental structure of carbon black.



The Model B Banbury mixer, *left,* and the **angle abrader,** *right,* are typical of the full range of equipment in the new Philblack Sales Service Laboratory.

Know the Philblacks! KNOW WHAT THEY'LL DO FOR YOU!

A **Philblack A FEF Fast Extrusion Furnace**
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

I **Philblack I ISAF Intermediate Super Abrasion Furnace**
Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

O **Philblack O HAF High Abrasion Furnace**
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

E **Philblack E SAF Super Abrasion Furnace**
Toughest black on the market. Extreme abrasion resistance. Withstands aging, cracking, cutting and chipping.

Phillips 66

PHILLIPS CHEMICAL COMPANY, Philblack Sales, 318 Water Street, Akron 8, Ohio. Export Sales: 80 Broadway, New York 5, N. Y. West Coast: Harwick Standard Chemical Company, Los Angeles, California. Canada: H. L. Blachford, Ltd., Montreal and Toronto.

SUNPROOF protected rubber gives ozone the "air"!

Now you too can prevent the damaging attack of ozone that causes cracking and frosting in farm tires and other rubber products, and severely shortens their service life.

SUNPROOF®—a specially developed blend of waxes— is an extremely effective inhibitor of static atmospheric cracking and frosting that gives ozone protection *all year 'round.*

Specifically recommended for tires for farm implements and earth-moving equipment, SUNPROOF also extends the useful life of auto, truck, and airplane tires, wire jacketing and insulation, mechanical goods, footwear, clothing, and a variety of rubber sundries.

Available in 5 different blends—SUNPROOF's JUNIOR, 713, REGULAR, IMPROVED, and SUPER—it melts and disperses thoroughly during mixing, is non-discoloring, and has no effect on rate of cure.

Make sure you're giving *your* natural rubber, GR-S, neoprene, and nitrile rubber stocks such as PARACRIL®, the protection they need. For further information, write on your letterhead to the address below.

Naugatuck Chemical

134 ELM STREET
NAUGATUCK, CONNECTICUT

Division of United States Rubber Company

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company, Limited, Elmira, Ontario

RUBBER CHEMICALS • SYNTHETIC RUBBER • PLASTICS • AGRICULTURAL CHEMICALS • RECLAIMED RUBBER • LATICES

NOW-HOSE IN A HURRY

with new, dry-blending PLIOVIC DB80V

MOLDERS and extruders! Here is a new resin specifically designed to let you turn out quality hose—or any molded or extruded item—in a hurry. It's PLIOVIC DB80V – a tailor-made, polyvinyl chloride that has all the properties a good, dry-blending resin should have.

Free-flowing characteristics. Adequate heat stability. Ready moldability and extrudability. Maximum physical properties. All these requirements have been built into PLIOVIC DB80V to permit economical compounding of quality products on conventional equipment.

Key to the excellent dry-blending properties of PLIOVIC DB80V is its ready and regulated absorption of plasticizer. This, in turn, results from careful control of particle size and distribution. Particles of PLIOVIC DB80V are dry, free-flowing and of irregular surface. This structure encourages absorption. Their narrow size range makes this absorption uniform. The result is fast, efficient compounding.

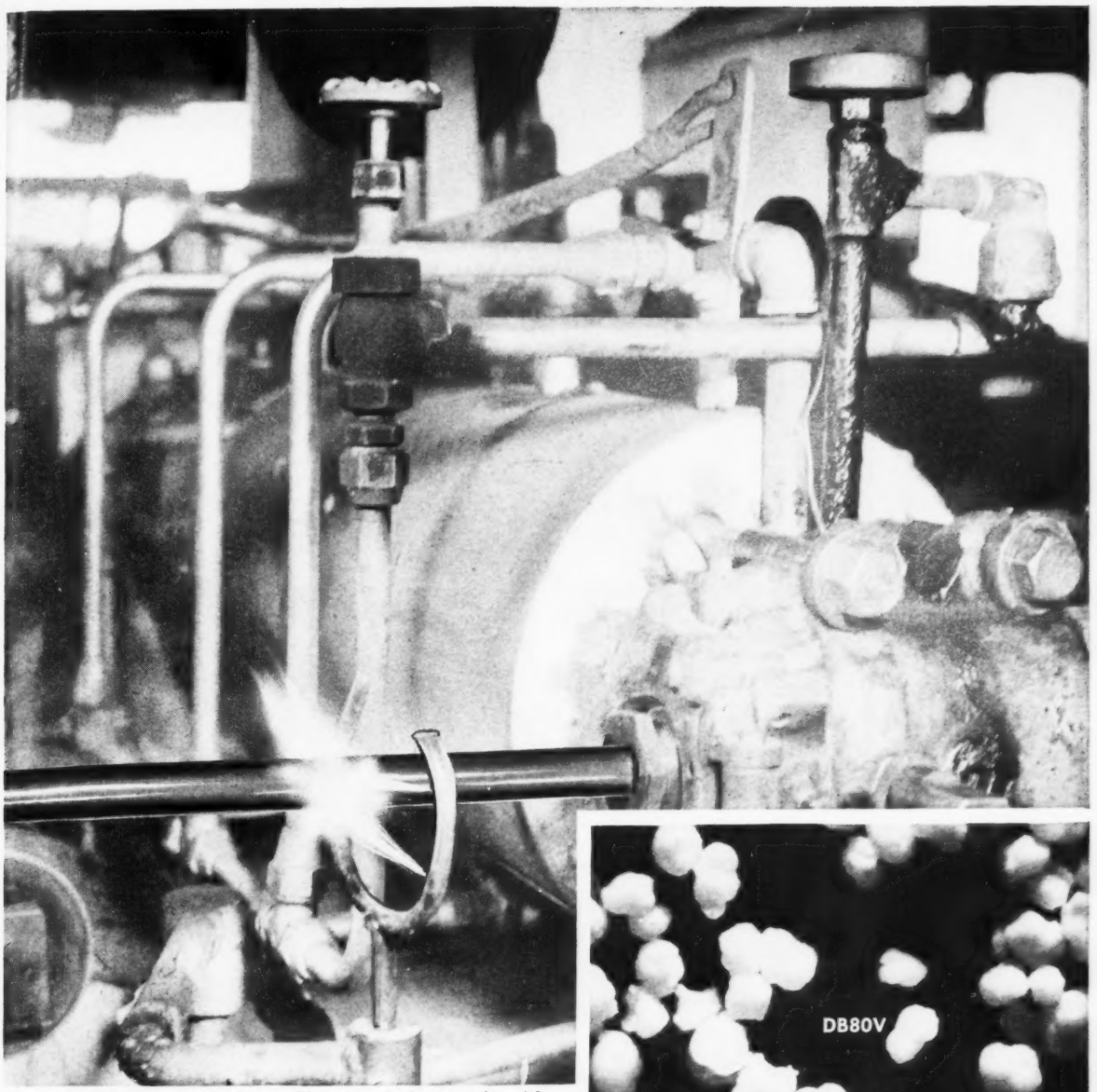
Only moderate heat is needed to mix PLIOVIC DB80V compounds. Thus, only a brief heat history is developed. This adds up to greater stability during the more severe conditions of forming and the useful service life of the end product.

If you haven't tried PLIOVIC DB80V, you should. And you can, simply by writing for samples and technical help to:
Goodyear. Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

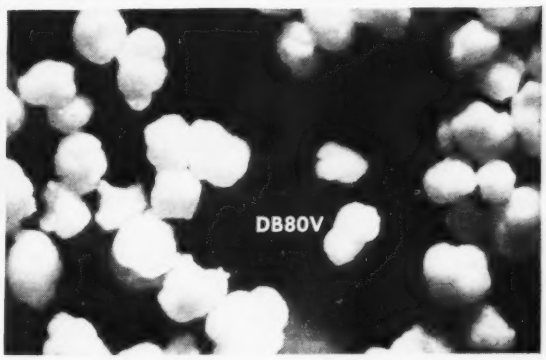
Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohi

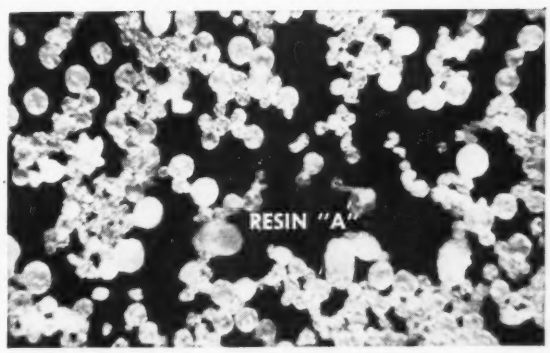
Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industr



Fast processing hose, that's fast selling too, is best made with PLIOVIC DB80V—thanks to its unique dry blending and extruding characteristics and its top physical properties.

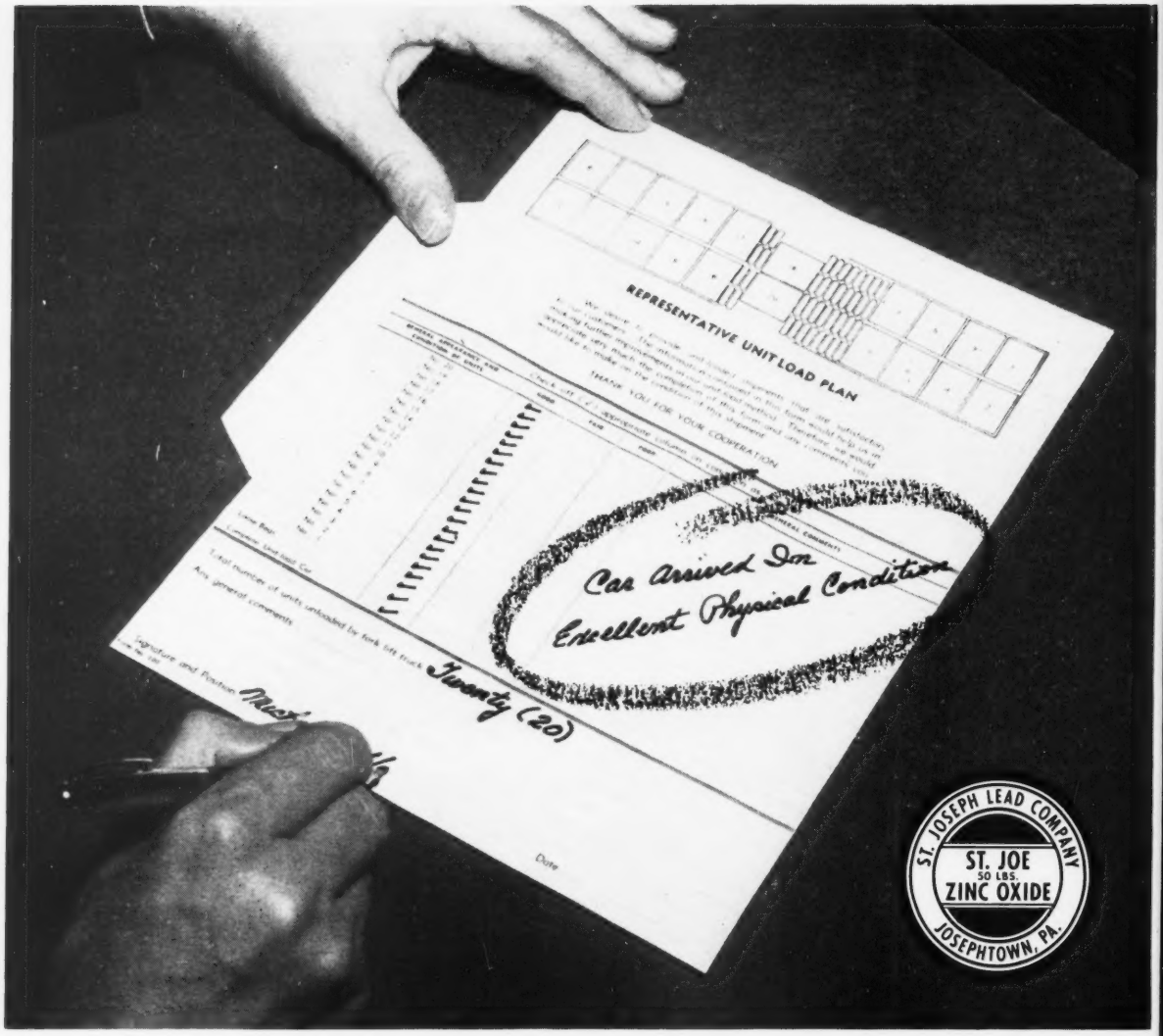
PHYSICAL PROPERTIES OF PLIOVIC DB80V	
Composition	100% Polyvinyl Chloride
Color	White
Nature of Particle	Dry, free-flowing
Size Distribution of Particles	100% thru 40 mesh
	80-100% thru 80 mesh
	0-15% thru 200 mesh
Intrinsic Viscosity	0.80 Av.
Specific Gravity	1.40 Av.
Bulk Density	38 lbs./cu. ft. av.



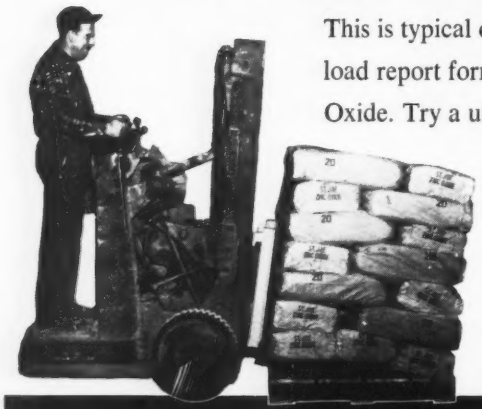


Excellent dry blending of PLIOVIC DB80V results from the type and size of its particles. These photomicrographs illustrate the differences between particles of PLIOVIC DB80V and those of a conventional, general purpose resin.

Akron, Ohi
Industr



"car arrived in excellent physical condition"



This is typical of the reports received from customers on our customer unit-load report form. This form accompanies each unit-load car of St. Joe Zinc Oxide. Try a unit-load shipment of St. Joe Zinc Oxide and experience:

1. A saving of up to 50% of the unloading cost
2. Increased storage capacity
3. Improved material handling
4. Greater cleanliness

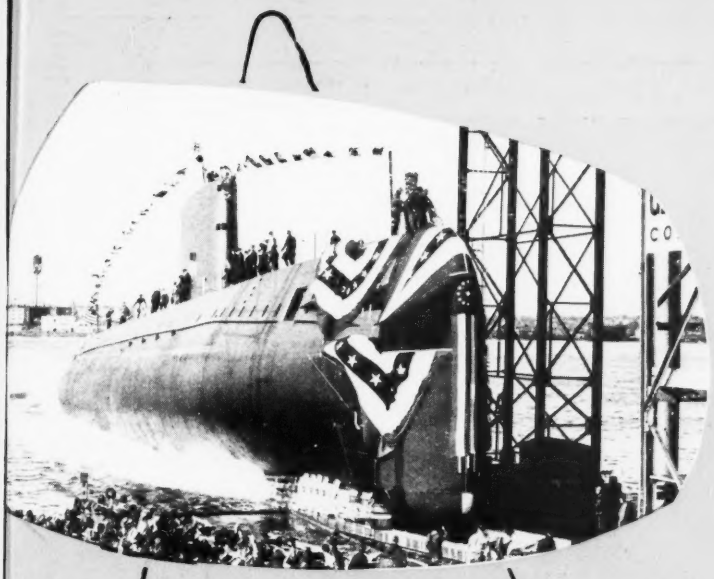
OUR 6-PAGE ILLUSTRATED FOLDER, CONTAINING DETAILED OPERATING DATA ON THE ST. JOE UNIT-LOAD METHOD IS YOURS FOR THE ASKING.

ST. JOSEPH LEAD COMPANY
250 Park Avenue, New York 17
Plant & Laboratory: Monaca (Josephtown) Pa.

t-
ac

NY
17
Pa.

VORLD



IN SUBMARINES...

World's first atomic-powered submarine, the USS Nautilus shown being launched at the yards of the Electric Boat Div. of General Dynamics Corporation. It will dive deeper, travel faster under water and stay submerged for months without refueling.

Setting new standards of **PROGRESS**

IN THE RUBBER INDUSTRY...

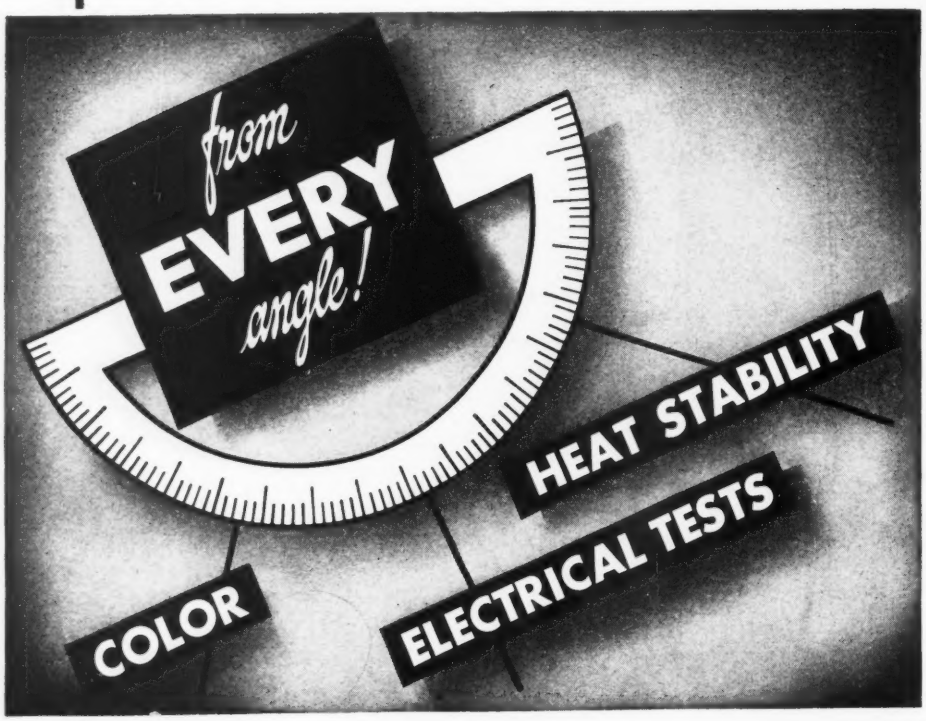
Muehlstein, as it has for over forty years, continues to advance its standards of service as leading supplier to the rubber and allied industries through progressive business methods and constantly increasing efficiencies of operation.

H. MUEHLSTEIN & CO. INC

60 EAST 42ND STREET,
NEW YORK 17, NEW YORK

CH OFFICES: Akron · Chicago · Boston · Los Angeles · Memphis · *WAREHOUSES:* Akron · Chicago · Boston · Los Angeles · Jersey City

CRUDE RUBBER, SYNTHETIC RUBBER, SCRAP RUBBER, HARD RUBBER DUST, PLASTICS



PIGMENT NO. 33

for Compounding

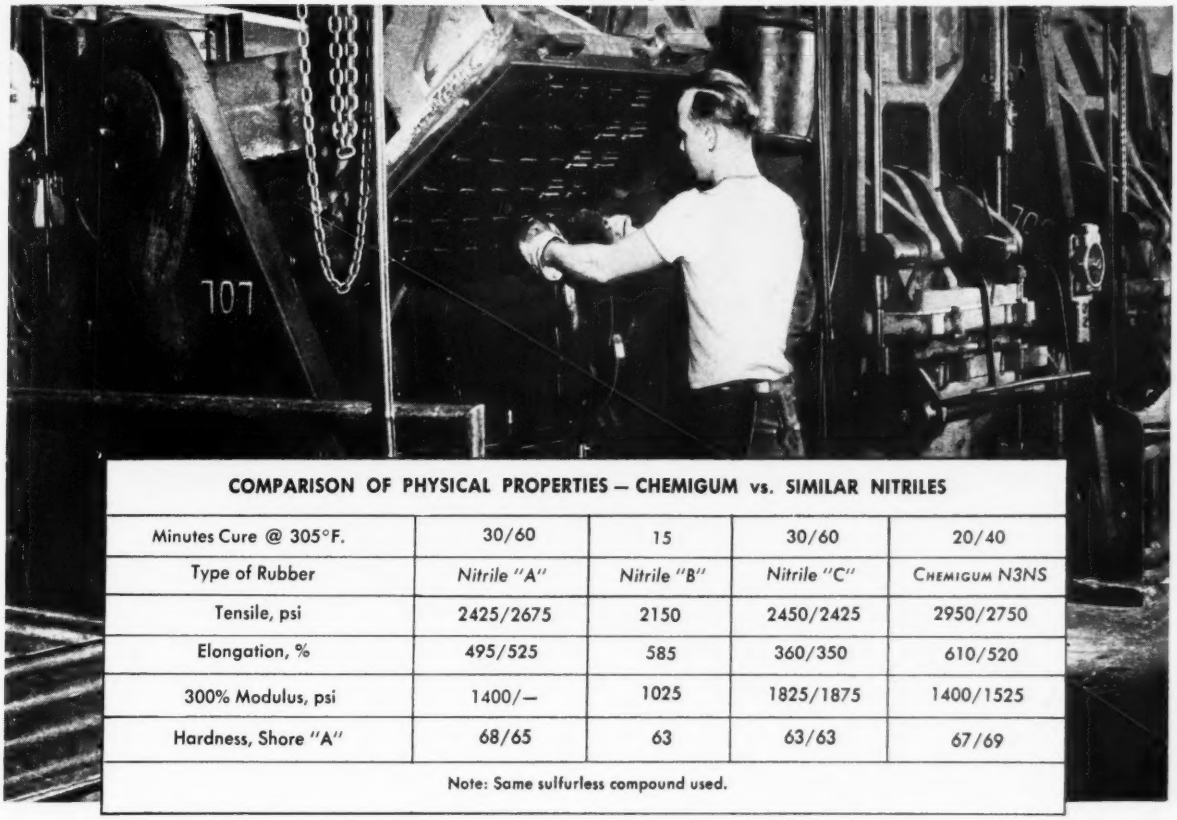
VINYLS AND SYNTHETIC RUBBER

Sample and technical data sent promptly on request

SOUTHERN CLAYS, Inc.

33 RECTOR STREET
NEW YORK 6, N. Y.

OIL- AND HEAT-RESISTANT PARTS are made faster and better with CHEMIGUM. Easier processing, quicker curing and superior physical properties (see table) are the reasons.



COMPARISON OF PHYSICAL PROPERTIES — CHEMIGUM vs. SIMILAR NITRILES

Minutes Cure @ 305°F.	30/60	15	30/60	20/40
Type of Rubber	*Nitrile "A"*	*Nitrile "B"*	*Nitrile "C"*	CHEMIGUM N3NS
Tensile, psi	2425/2675	2150	2450/2425	2950/2750
Elongation, %	495/525	585	360/350	610/520
300% Modulus, psi	1400/—	1025	1825/1875	1400/1525
Hardness, Shore "A"	68/65	63	63/63	67/69

Note: Same sulfurless compound used.

FASTER SULFURLESS CURES

using less acceleration come with CHEMIGUM

And you get better physical properties, too.

Just look at the table above. A basic oil-resistant compound was used. Sulfur was omitted to obtain high heat-resistance. All the other rubbers required more acceleration. Nitrile "C" needed considerably more, plus some sulfur for proper cure. Yet the CHEMIGUM compound cured much faster and gave higher tensile, elongation and hardness.

Moreover its heat-resistance was equal to or better than that of the others. So was its solvent-resistance. And the CHEMIGUM processed much easier to give you still another good reason for trying this use-proved nitrile with its new, light color and smaller bale.

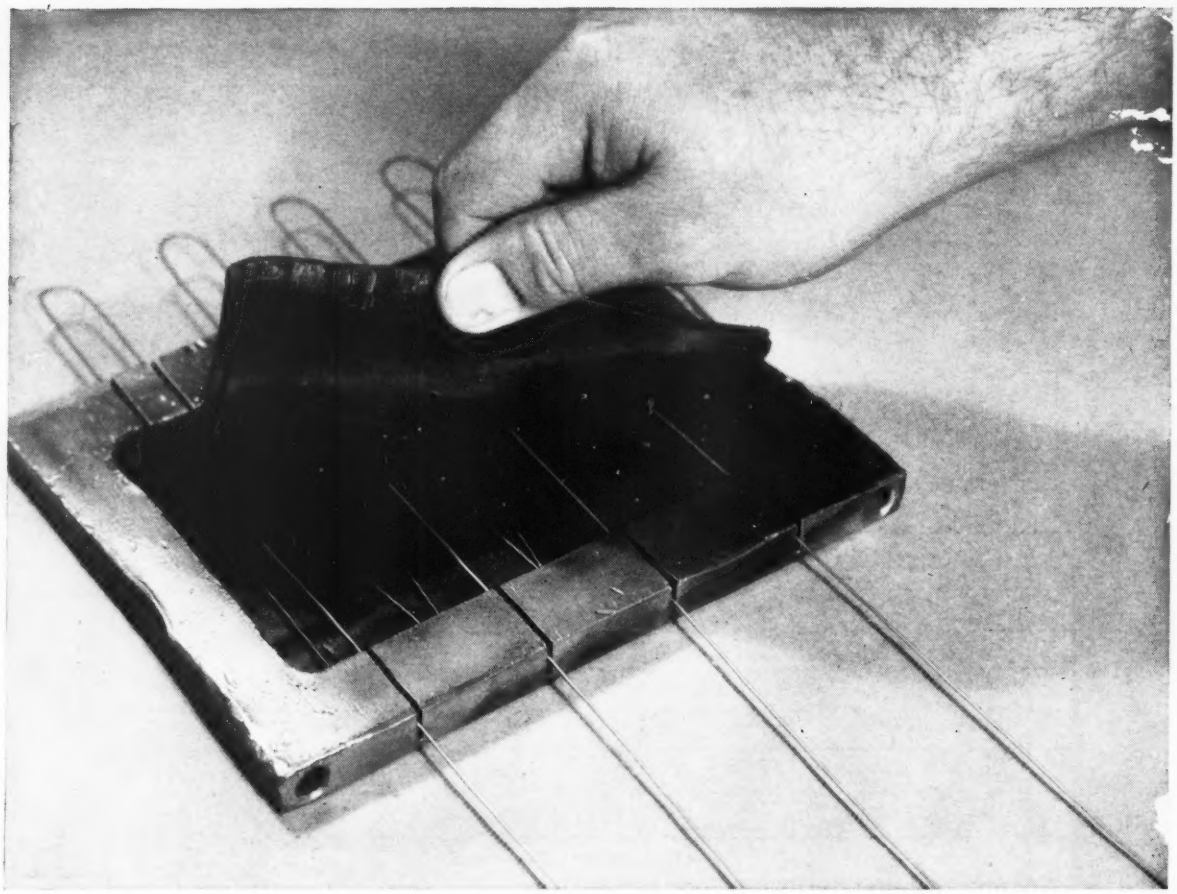
A postcard will bring you plenty of samples and technical help. Simply send it to:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry



How we use pull...

to help your wire do a better job!

● It doesn't pay to take things for granted. That's why extensive wire research goes on *all* the time at National-Standard — behind-the-scenes work that time and again helps our customers speed operations, save material, improve their products and cut costs.

The lab test being rigged above, for example, will reveal the rubber adhesion qualities of a newly developed wire finish. After the rubber layers are vulcanized, carefully recorded pull will be exerted on the imbedded wire until it finally breaks loose. Only by such painstaking test work can you be assured of new, improved qualities and characteristics that will let you make the *most* of wire.

Whatever use you make of wire—in rubber products, or anything from bottle caps to zither strings —keep in mind that National-Standard's facilities, experience and "groundwork" are always ready to help you put wire to work with the *greatest* efficiency at the *lowest* cost.

NS
NATIONAL-STANDARD
Company
NILES, MICHIGAN

DIVISIONS OF NATIONAL-STANDARD CO.

ATHENIA STEEL	*Clifton, N. J.*	Flat, High Carbon, Cold Rolled Spring Steel
NATIONAL-STANDARD	*Niles, Mich.*	Tire Wire, Stainless, Fabricated Braids and Tape
REYNOLDS WIRE	*Dixon, Illinois*	Industrial Wire Cloth
WAGNER LITHO MACHINERY	*Jersey City, N. J.*	Metal Decorating Equipment
WORCESTER WIRE WORKS	*Worcester, Mass.*	Round and Shaped Steel Wire, Small Sizes

INDOIL®
CHEMICAL PRODUCTS

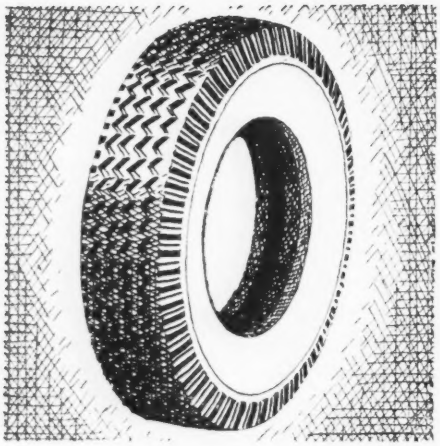
for
LOW COST
HARD RUBBER COMPOUNDS

INDONEX PLASTICIZERS
REG. U.S. PAT. OFF.

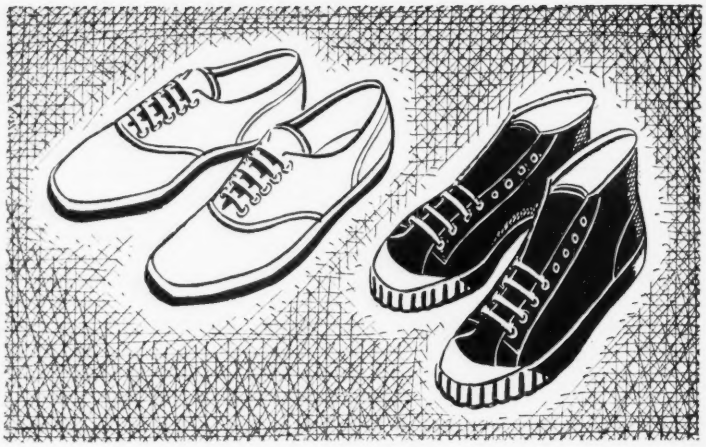
permit increased loadings — diminish blistering and porosity — help keep molds clean — assist in easy mold release. Circular 13-49 shows compounds for battery box covers or other uses and for low cost battery boxes.

Send for:
Circular 13-49 and
General Bulletin 13

INDOIL CHEMICAL CO.
910 SOUTH MICHIGAN AVENUE
CHICAGO 80, ILLINOIS

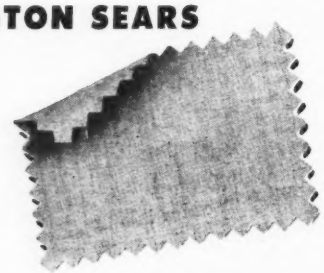


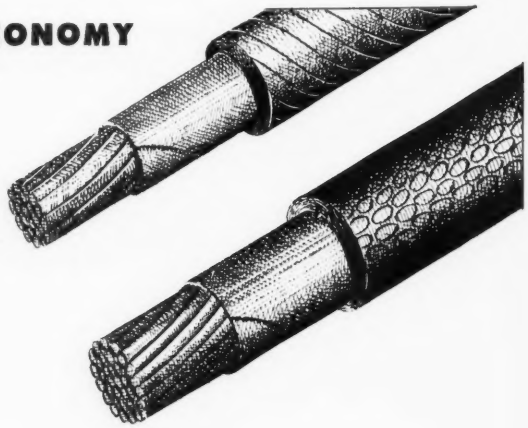
Woven for strength and abrasion resistance, chafer duck is typical of Wellington Sears reinforcing fabrics.



Wellington Sears rubber footwear fabrics include sturdy, economical and easily adhesive enameling duck for tennis and gym shoes and other rubber footwear.

YOU GET UNIFORM QUALITY AND ECONOMY WITH WELLINGTON SEARS COLUMBUS SHEETING



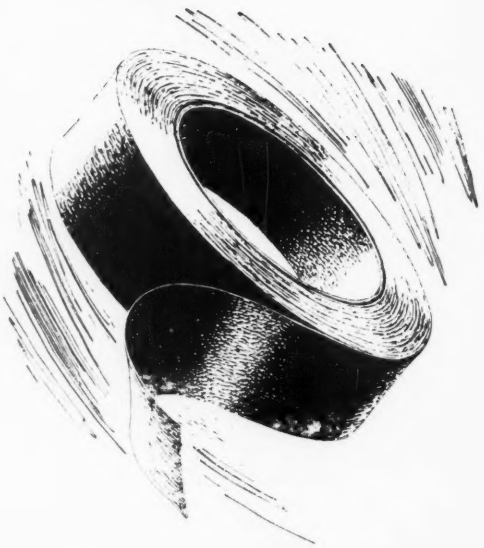


Matching quality, yard after yard, is the basis for Columbus sheeting's long-standing reputation in rubber fabrication. Lightweight and economical, it is carefully woven to yield an absolute minimum of rubberizing process rejects.

These sheetings are made 40 to 120 inches wide in weights from 2 to 5 ounces per square yard. For submarine and other cable wrapping . . . friction tape . . . heavy duty raincoats . . . hospital sheeting . . . Columbus sheeting has versatility to equal its uniformity.

Other cotton, synthetic, and blended fabrics available from Wellington Sears for coating, specialties, and mechanical rubber goods are listed at right. If it's a rubber-and-fabric problem, talk it over with Wellington Sears.

Write for your free copy of "Modern Textiles for Industry" which includes pertinent information on rubber applications. Address: Wellington Sears Co., Dept. K-2, 65 Worth St., N. Y. 13.



Superior Fabrics for the Rubber Industry

- Belting duck
- Hose duck
- Enameling duck
- Army duck
- Single and plied-yarn chafers
- Sheeting
- Airplane cloth
- Balloon cloth
- Nylon, high tenacity rayon, other synthetics and combinations.

Wellington Sears

A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

FIRST In Fabrics For Industry

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

Offices In: Atlanta • Boston • Chicago • Detroit • Los Angeles • New Orleans • Philadelphia • San Francisco • St. Louis

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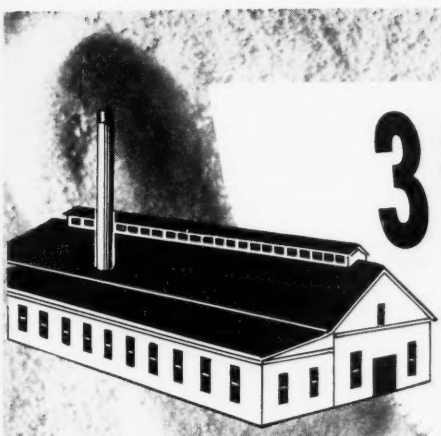
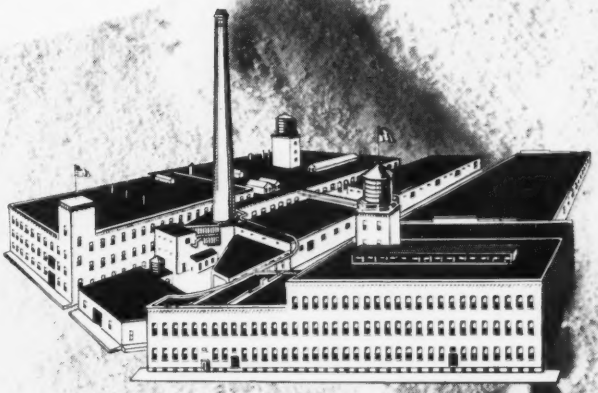


3 GIANT STEPS TO BRING YOU *Constantly* BETTER RECLAIMS

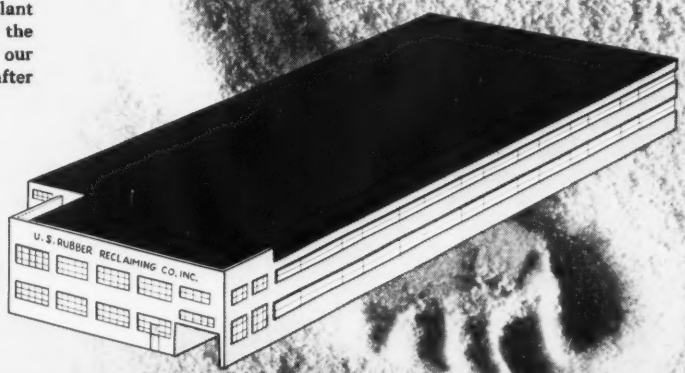


"Remember when" . . . the chief use of Reclaimed Rubber was in buggy and bicycle tires, boots, shoes, galoshes and hose? Well, long before even that widespread use was developed . . . U. S. Rubber Reclaiming Co. in 1883 pioneered the use of Rubber Reclaims in the tiny little plant above with a TOTAL CAPACITY of 1-1/2 tons per day.

Sure . . . the reward for progressive thinking and aggressive planning bears fruit and in the "second" step illustrated here, we built one of the biggest reclaiming plants in the world in 1902. Just building this plant and making a further success of the original idea is not important. The fact that we added a laboratory and staffed it with young, imaginative and far-seeing brains WAS at that time revolutionary . . . and STILL IS IMPORTANT. It's important to you because the product development phase of our business, started then, has resulted in many FIRSTS in the industry.

Typical of this is our recently established plant at Cheektowaga, N. Y. which produces ONLY the results of an *original idea* that paid off with our *now famous* Reclaimator Reclaims developed after years of research and study. This same progressive and aggressive attitude has recently produced the now well known "FLO-MIX" Powdered Reclaim.

Whatever you make out of rubber . . there is probably a Buffalo Reclaim to help you make it *better*. If you have a problem regarding rubber products, our staff can help you. Why not consult us?



Our 71st year serving the industry solely as reclaimers

U.S. RUBBER RECLAIMING COMPANY, INC.

P. O. BOX 365 BUFFALO 5, N. Y.

NRM

2½" RUBBER EXTRUDER

HEAVY DUTY
MODEL 50

- **COMPACT**
- **RUGGED**
- **PRECISE**
- **VERSATILE**

NRM's under-cut feed box assures good hand, or mechanical strip, feeding of all types of rubber stocks.

NRM's new 2½" Model 50 extruder is designed to give the most production in the minimum of floor space. The base of the extruder measures only 19" x 23½". Its overall length is only 47¾". Its height is just 53⅛". Yet, it has a nominal capacity of 200-250 lbs. per hour and is ruggedly built to give years of trouble-free service.

The Model 50 carries all of the features that have made NRM extruders first choice for high quality, precise extrusions of all types of rubber compounds. The under-cut feed hopper — the heat treated alloy steel feed screw with hardened flight surfaces — the accurately machined cylinder with replaceable Xaloy liner — the heavy duty cone worm gear reduction unit — the extra heavy thrust and radial bearings — the sturdy fabricated steel base — all combine to give maximum, uniform production at minimum cost.

Look into the Model 50, today. Just a postcard will bring full information — promptly and without obligation.

2083

NATIONAL RUBBER MACHINERY COMPANY

NRM

Creative Engineering

General Offices & Engineering Laboratories: Akron 8, Ohio

East: 384 Getty Ave., Clifton, N. J.

West: S. M. Kipp, Box 441, Pasadena 18, Cal.

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TY-PLY the RUBBER-TO-METAL ADHESIVE

that Bonds for a Lifetime

TY-PLY (Q) or (3640) for bonding Natural, GR-S, and Butyl

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TY-PLY will adhere most vulcanizable rubber compounds to almost any clean metal surface

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TY-PLY has stood the test of time . . . since '39

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POLYBUTENES

An important raw material in a variety of mechanical rubber products

Since 1935, when Oronite Polybutene was first produced and sold, these important raw materials have become widely used in a variety of rubber products. Their light color makes them specially acceptable for compounding light-colored molded rubber goods.

PROPERTIES: Oronite Polybutenes are clear, light in color, tacky, chemically inert liquids. They will not become gummy or waxy, do not harden, darken or change in any essential property over long periods of atmospheric exposure. Oronite Polybutenes can readily be emulsified using standard techniques and equipment. In the emulsified form or in their natural form, they are useful as tackifiers, plasticizers or extenders for natural or synthetic rubber products. Available in a number of high viscosity ranges to meet your requirements. Write or call any Oronite office for Polybutenes technical bulletin.

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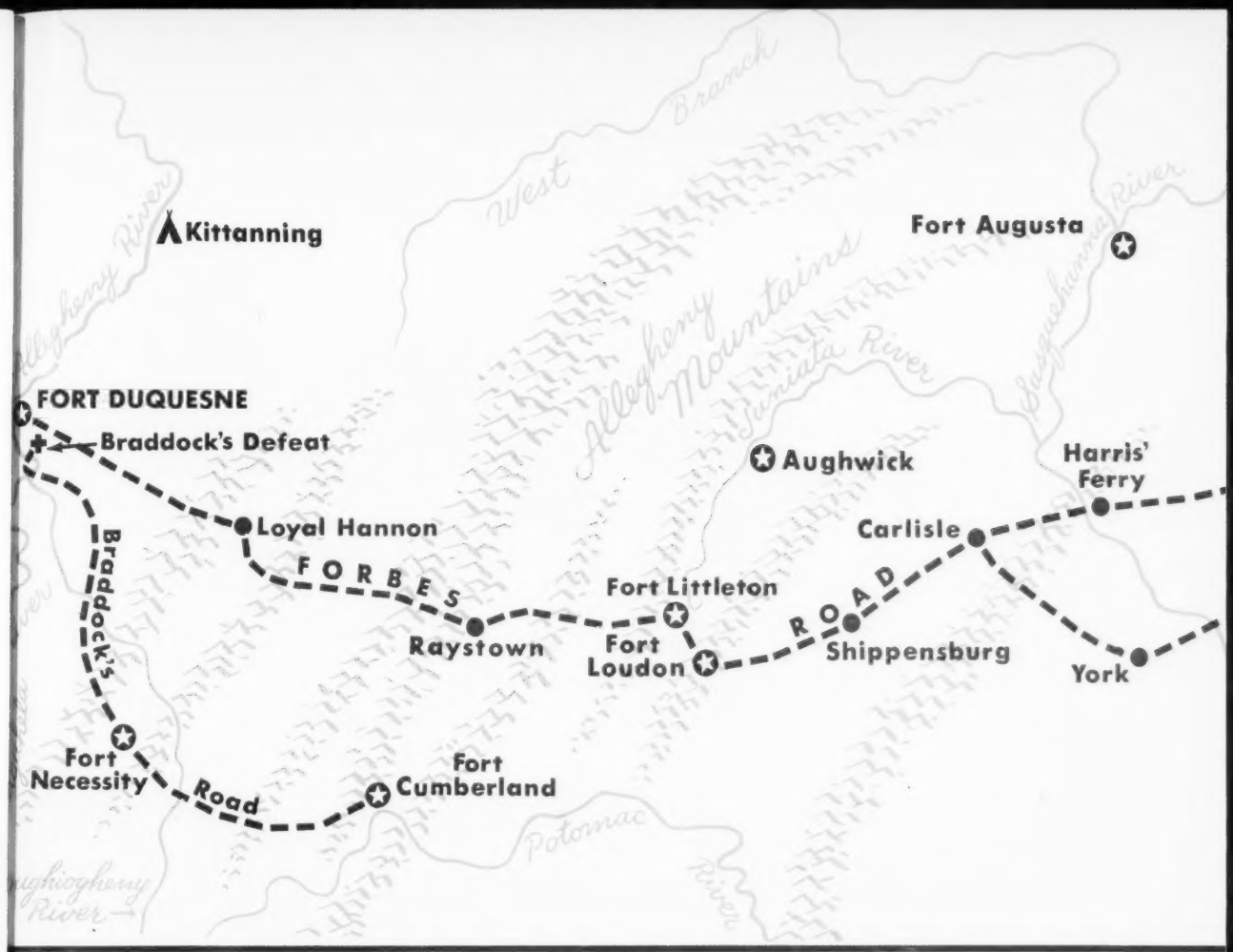


FORBES ROAD

Built in 1758 across the rugged wilderness of western Pennsylvania for use of the Forbes Expedition in the conquest of Fort Duquesne (Pittsburgh). Directed by Col. Henry Bouquet, working parties aggregating 1,400 men linked a chain of advance fortifications beginning just west of Bedford and continuing through Ligonier to Pittsburgh.

The road was a continuation of an already established route from eastern Pennsylvania that connected up Lancaster, Carlisle and Chambersburg.

For many years the Forbes Road was the chief highway between the East and the Ohio Valley, its military values supplemented by streams of emigrants and freighting trains. The original route is roughly paralleled today by U. S. Route 30.

The time of the building of the road was during the French and Indian War and its construction was ordered by the governor of Pennsylvania. The expedition was led by Brig. Gen. John Forbes, and its purpose was to provide an avenue of trade to the Ohio Valley. It became a very important highway for western emigration after the close of the war.

If you watched along the Pennsylvania Turnpike, or on U. S. highway 30, you would quickly see how far man has progressed in transporting himself and his products. East and west are connected as these greatly used routes pour thousands of automobiles, trucks and buses daily toward the Atlantic seaboard, and to the midwest and to the far-west where nearly two centuries ago men built a roadway with fortifications at strategic intervals.

Contributing to man's progress in transportation is the modern, durable rubber tire, and contributing to the long-wearing tire is the substance called "carbon black" first made on a large scale in the general area of the Alleghenies.

United Carbon Company, makers of dependable "United Blacks" is constantly improving its blacks through advanced research and engineering, so that rubber tires will always be equal to the demands of the tire industry for a constantly better product.

UNITED CARBON COMPANY, INC.

DIXIE 60 **DIXIE 20**

Two outstanding quality blacks from United's ultra modern Ivanhoe furnace black plant (near Franklin, La.).

DIXIE 60 — high abrasion (HAF) oil base black is renowned for the processing, reinforcement and stamina required by today's tire treads and high quality mechanical goods for satisfactory performance.

DIXIE 20 — semi-reinforcing (SRF) gas base black is ideal for carcass, tube, bead wire insulation and numerous mechanical rubber goods, depending on a fine balance of easy processing, moderate reinforcing, high resilience, low heat build-up, and high resistance to flex cracking.

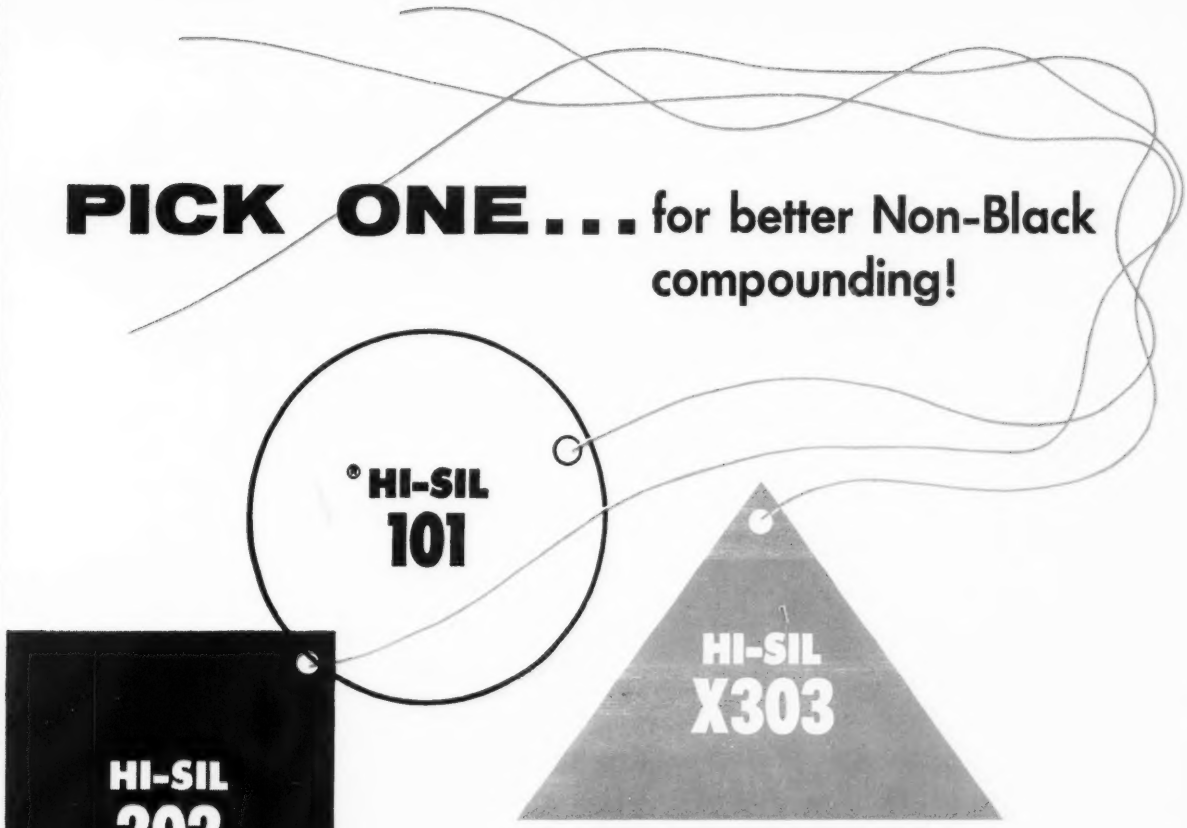
United Blacks are dependable for uniformity and performance. Standardize on United Blacks! You will be more than satisfied.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, WEST VIRGINIA

NEW YORK AKRON CHICAGO BOSTON MEMPHIS

PICK ONE... for better Non-Black compounding!



If you have a problem in compounding non-black natural or synthetic rubber stocks, try Hi-Sil.

Hi-Sil has proved itself outstanding to many compounders through improved performance, superior results, and lowered volume cost.

There are three members in Columbia-Southern's Hi-Sil group: Hi-Sil 101, Hi-Sil 202, Hi-Sil X303. Hi-Sil X303 is an experimental high purity material specifically developed for silicone rubber compounding. The physical properties of each vary slightly to emphasize different characteristics. There is one ideally suited for you and your problems. Write today for complete data and working samples of Hi-Sil, Technical Service Department, at the Pittsburgh address.

HI-SIL, an exclusive Columbia-Southern reinforcing pigment, is a precipitated silica of extremely fine particle size.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
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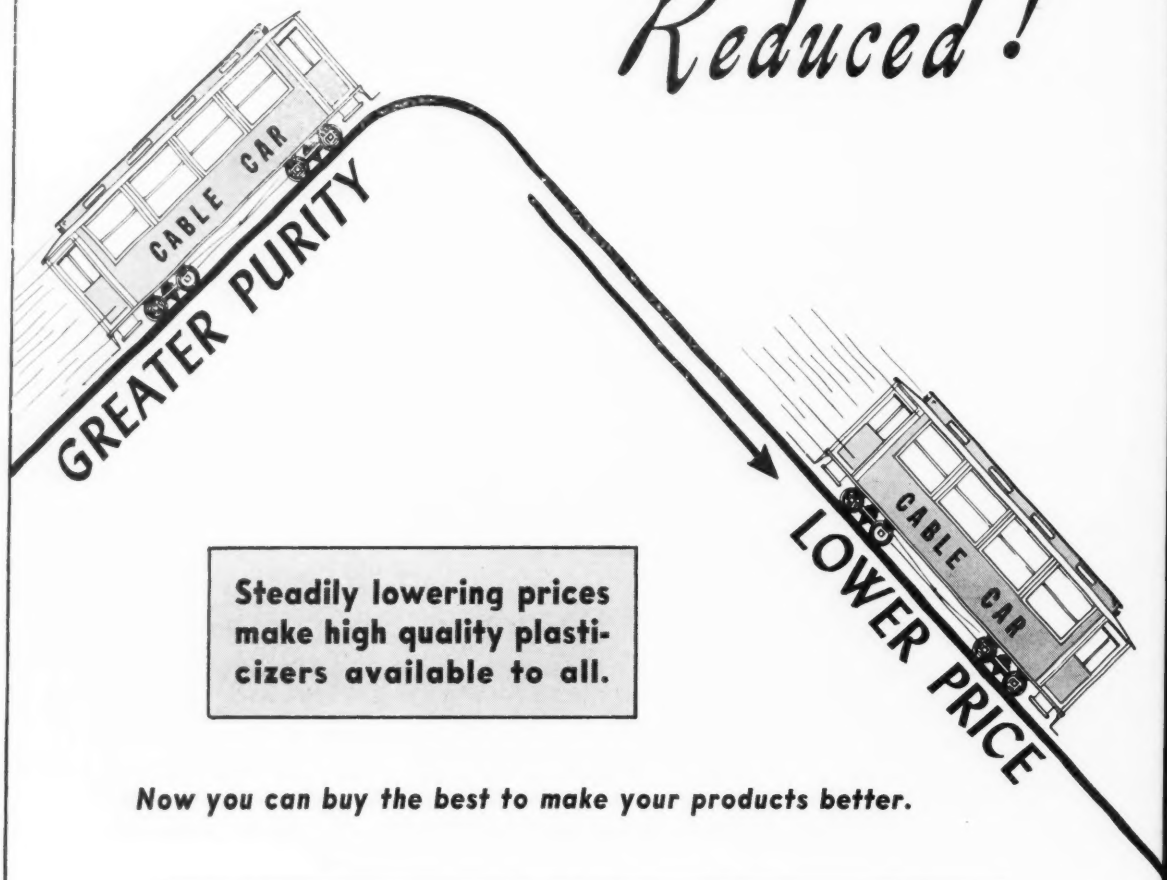

Steadily lowering prices make high quality plasticizers available to all.

Now you can buy the best to make your products better.

Newly reduced prices of Sebacates now make it possible to incorporate their well known superlative features into <u>your</u> product.

BINNEY & SMITH CO. • Distributor to the Rubber Industry

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HARDESTY CHEMICAL DIVISION
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Manufacturers of Sebacic Acid

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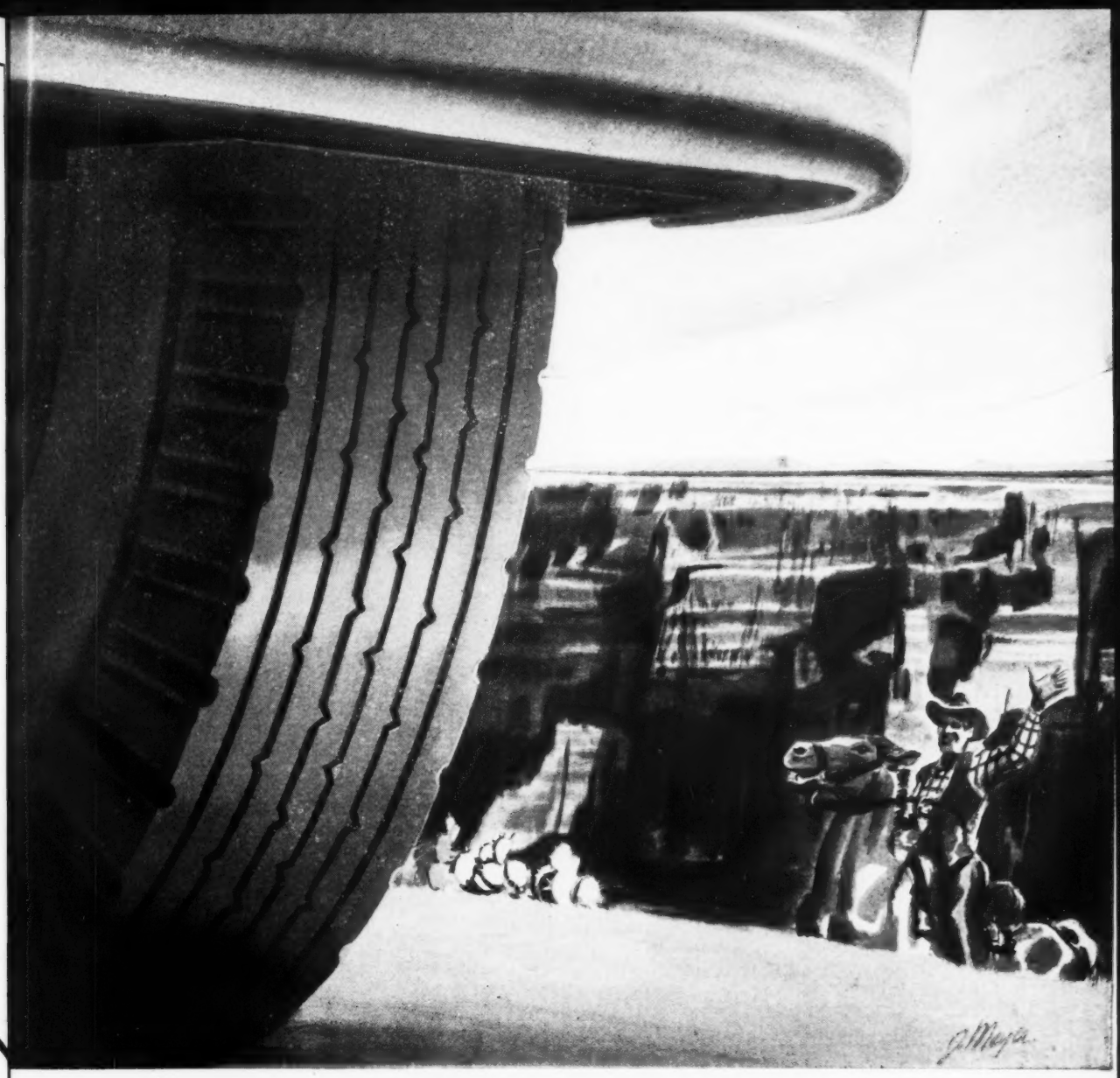

RELIABLE ZINC OXIDES

AZO-ZZZ-44 and AZO-ZZZ-55 assure good dispersion and easy processing because of their uniform particle size and absence of extreme fines. With AZO-ZZZ-11, 22, 33, (Acicular types) and special grades, a complete range of zinc oxides is offered for every rubber requirement.

A RELIABLE SOURCE

American Zinc assures an uninterrupted supply of zinc oxide. Recent discovery and development of a new, large ore body, added to previous American Zinc reserves, provides sufficient ore to last many years at the current rate of production.

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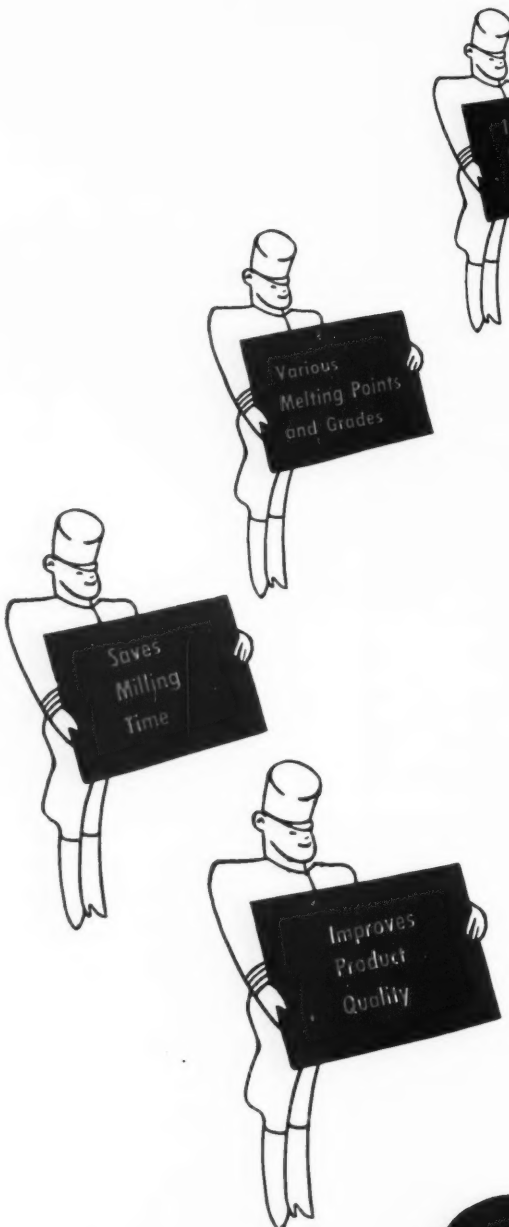
Neville Chemicals



for improving **rubber** products

Neville's years of experience with the problems of rubber manufacturers have produced a superior line of resins and oils for greater ease and uniformity in rubber processing.

Neville Coumarone Resins have long aided in processibility and pigment dispersion with improved physicals including heat stability, tensile and tear. They insure highest quality and maximum economy of production.

Let us help you select the right grade for your purpose.

NEVILLE

NEVILLE CHEMICAL CO.

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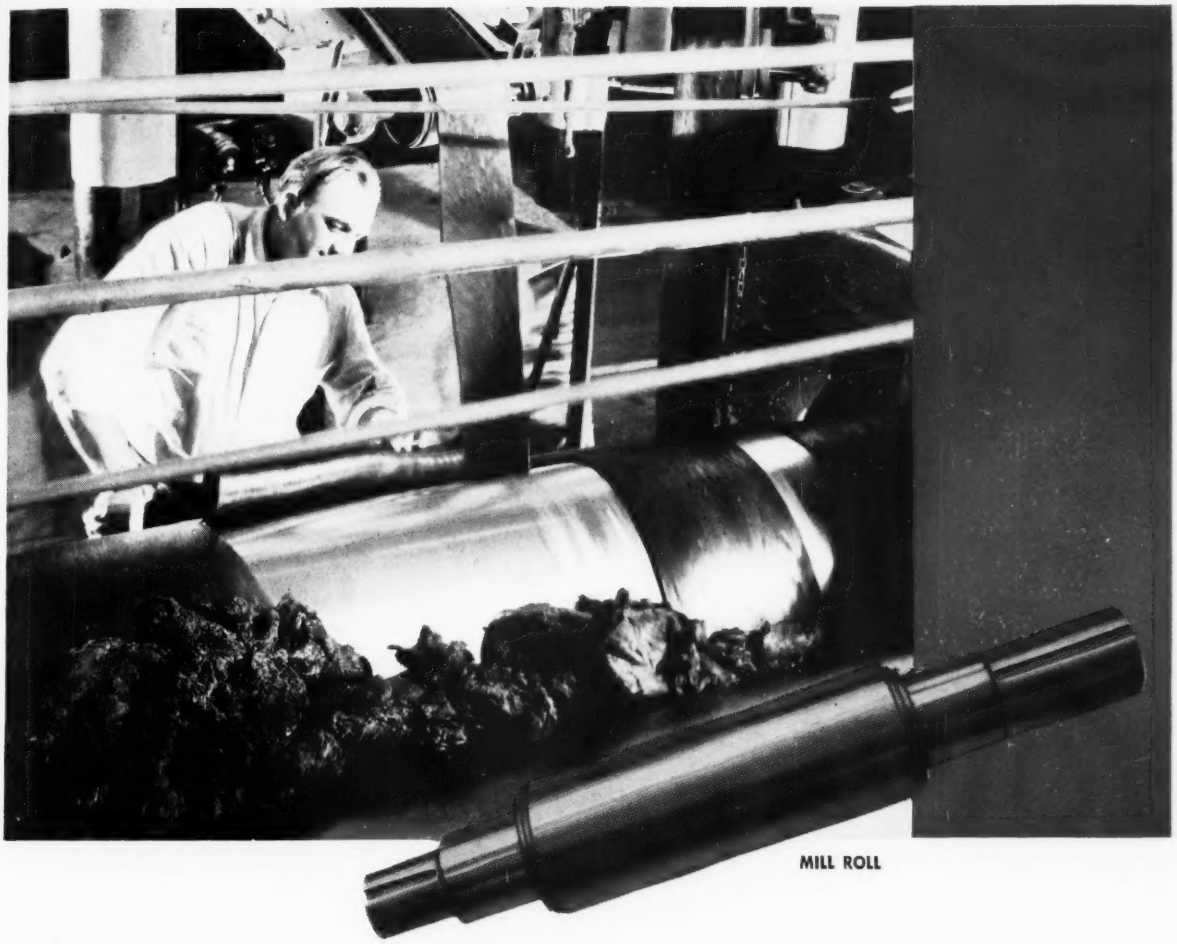
R-52



MILL ROLL

CONSIDER THESE FACTS

before you order replacement rolls

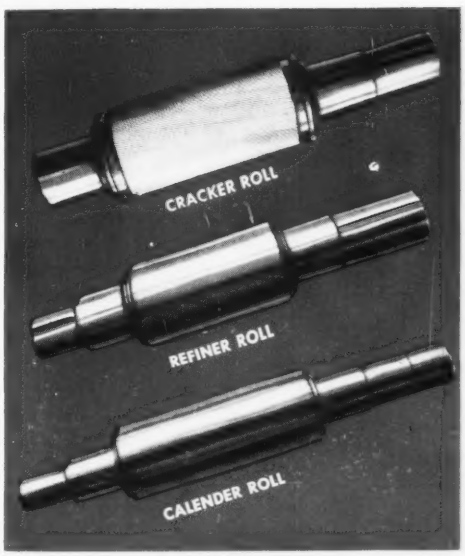
A CENTURY OF SERVICE to the rubber industry has given Farrel-Birmingham an unusual understanding of its requirements. Through the experience gained, the company has learned how to make rolls to fit your needs precisely.

Experience is the only answer to many of the problems that arise. It is of vital importance in determining the depth of chill and correct metal mixture to be used . . . in engineering a roll for proper temperature control . . . in figuring roll crown . . . or in designing the corrugations for washer or cracker rolls.

THE WORLD'S LARGEST SPECIALTY ROLL SHOP is equipped to make rolls of any size required, for any purpose, and in many different metal formulas of chilled iron, alloy iron, or Meehanite metal. At Farrel-Birmingham you will find specialized production facilities . . . quality control methods from metallurgical analysis of raw materials to final inspection of the finished roll . . . and men experienced in every phase of roll manufacture.

Write for information about rolls for specific applications.

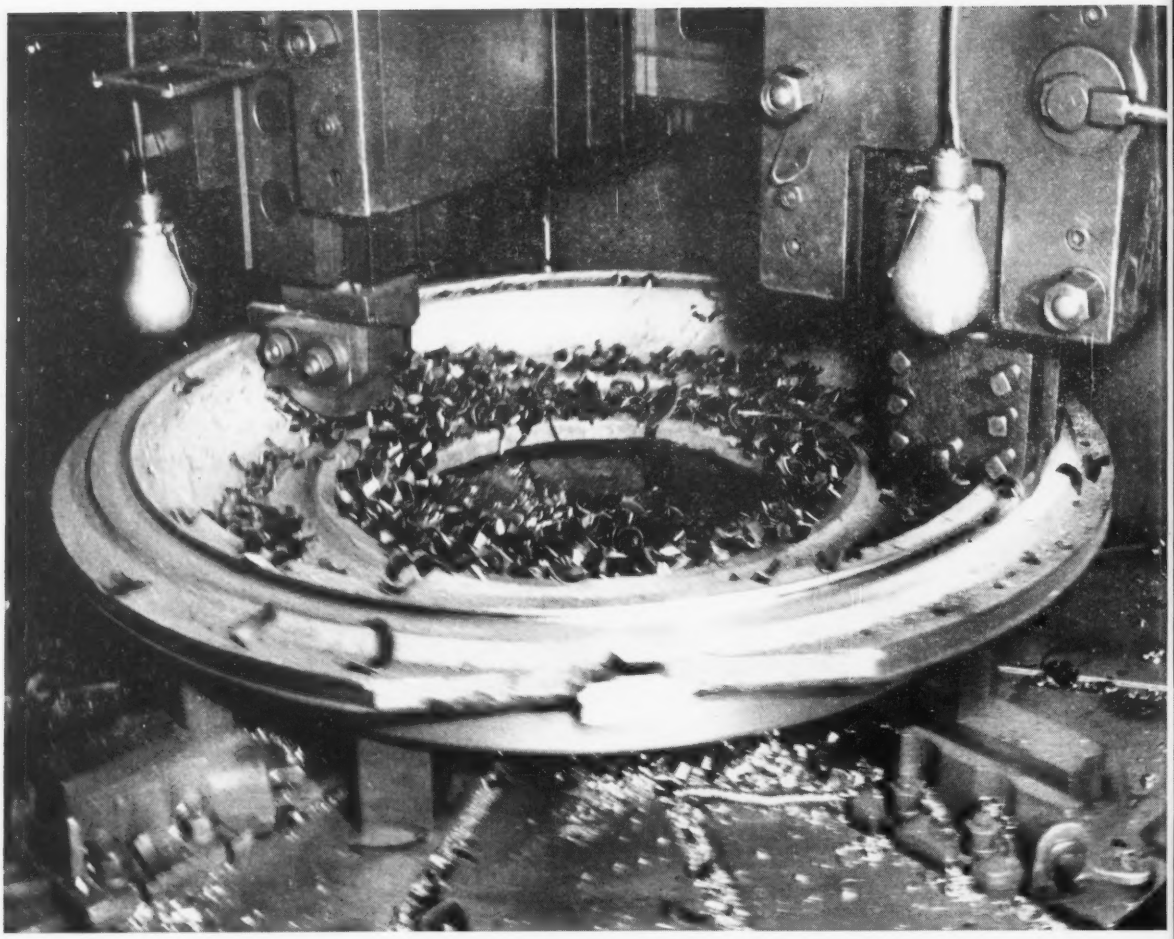
Farrel-Birmingham®



FB-912

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston



This forging will be *Another*

BRIDGWATER TIRE MOLD

MAKING its *first* stop on the production line of Bridgwater's Athens Machine Division, in Athens, Ohio, is this rough forging for an automotive tire mold. 10 to 14 stops later—depending on its type and size — the forging will emerge, mirror-polished, precision engraved . . . a *finished* Bridgwater Tire Mold. It is ready, then, for the production line of a tire plant — perhaps yours — where its higher quality and greater workability will contribute conspicuously to smoother, speedier flow of quality tires.

Typical of our "scope" at Athens is that this Vertical Boring Mill is only one of 11 available in our plant. Typical also of Bridgwater's *continuing* efforts to streamline mold making processes, is that these mills are now being fitted with tracer control equipment which will substantially reduce the time — and cost — of the machining operation shown here.

Tire mold production at Athens is unique in that our *entire* organization of trained technicians and metalworking craftsmen — all equipment and machines — much of it our own special design — and our systems of production "flow" are unhampered by any other manufacturing obligation. In fact, the Athens Machine Company is the *only* plant in the world devoted exclusively to tire mold making.

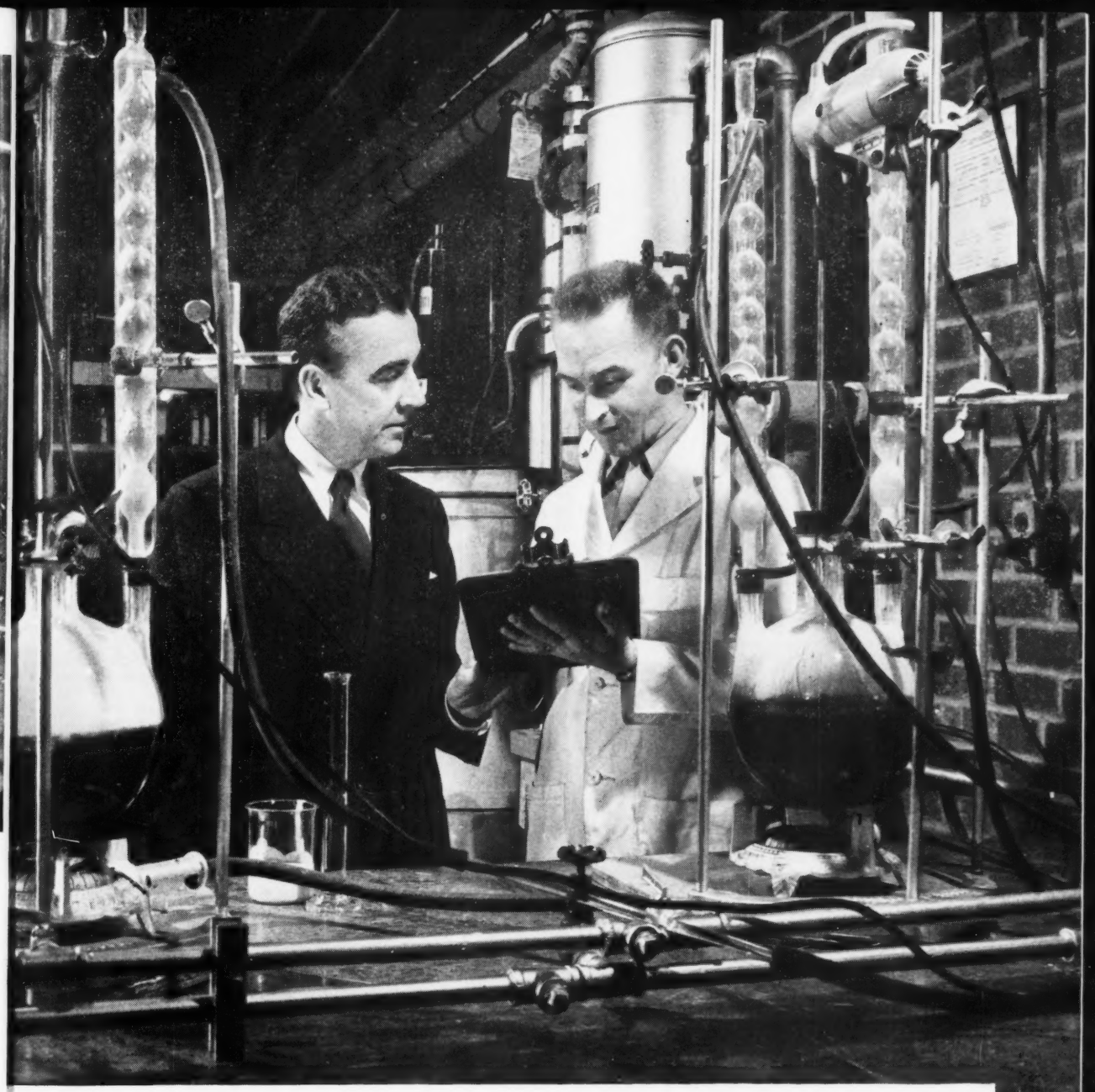
That's why, at Athens, you can get precision-made molds of any type and size, in engraved steel, cast iron or aluminum, *faster,* and at costs that reflect favorably in a period of adjusting economy.

ATHENS MACHINE DIVISION

BRIDGWATER MACHINE COMPANY

Akron, Ohio

1896



Compressing 200,000 square feet into 60

You're looking at a giant titanium plant in miniature—as set up in the Glidden Laboratories in Baltimore. It is a small-scale "plant" that transforms jet black titanium ore into gleaming white pigment. This hydrolysis process provides an accurate check on every shipment of titanium ore received by Glidden.

It's all part of the vigilant Glidden quality control program—established to assure you the finest in pigments of all types—ZOPAQUE Titanium Dioxides; CADMOLITH Reds and Yellows; SUNOLITH Lithopones. Write for detailed specifications today.

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CHEMICALS
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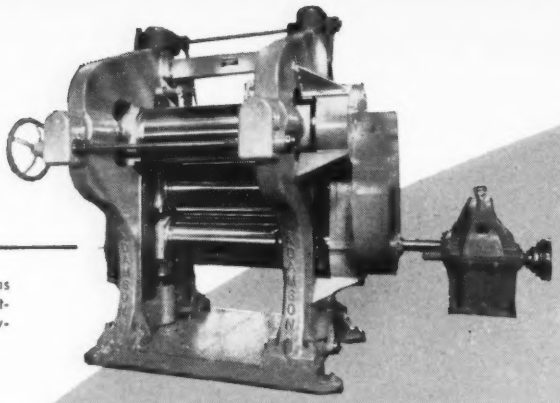


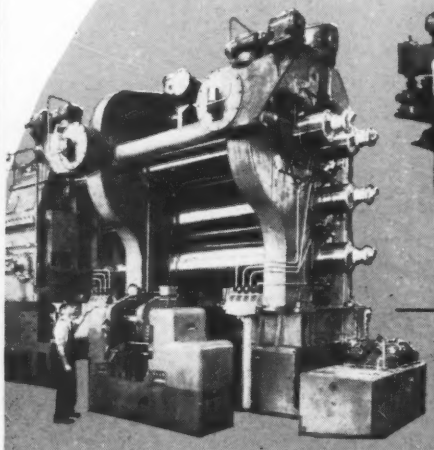
16" x 36" FOUR-ROLL CALENDER

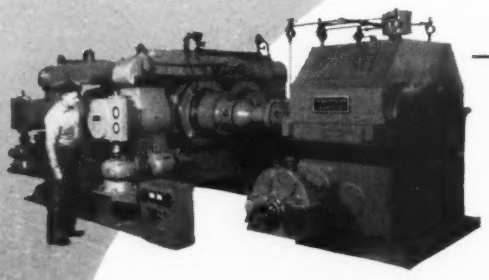
For rubber and sponge products. Has sleeve bearings, herringbone connecting gears, manually operated screwdowns, and grease lubrication.

20" x 54" THREE-ROLL CALENDER

For medium speed production of various types of rubber products. Equipped with herringbone even speed and friction gearing, sleeve bearings, grease lubrication, and motorized roll adjustments. Drive can be adapted to suit available space.

ADAMSON UNITED CALENDERS



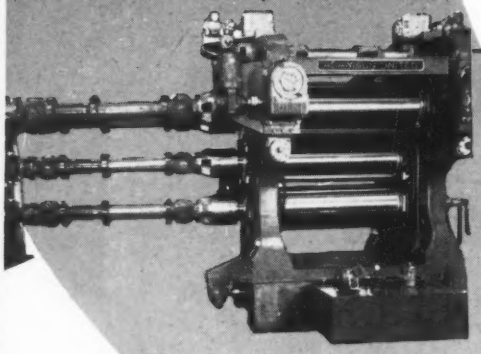


30" x 54" TWO-ROLL HORIZONTAL CALENDER

For finishing asphalt floor tile. This machine is equipped with roller bearings, drilled rolls, pinion stand drive with universal couplings, motorized roll adjustments, and adjustable speed control for tandem operation.

36" x 92" FOUR-ROLL PRECISION CALENDER

Designed especially for the production of thin plastics film up to 72" wide. This unit also is equipped with roller bearings; has roll crossing and zero clearance equipment, motorized roll adjustments, separate pinion stand with universal couplings and flood lubrication.



24" x 68" FOUR-ROLL DELUXE PLASTICS CALENDER

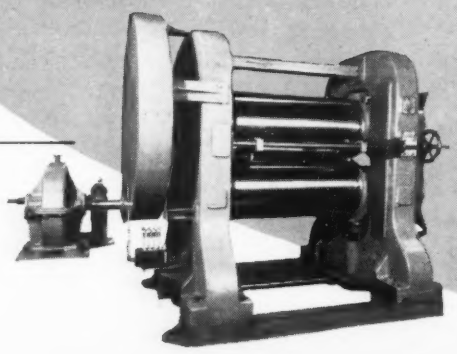
Produces 57" wide film at high speeds. Has roller bearings, zero clearance equipment, roll crossing device, roller bearing universal couplings, drilled rolls, motorized stock guides and flood lubrication. Drive is through a separate pinion stand which has its own complete flood lubrication system.

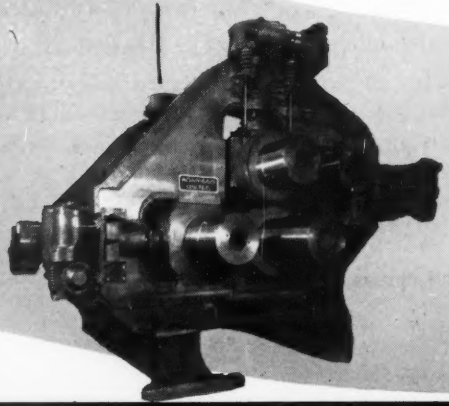
24" x 68" FOUR-ROLL Z-TYPE RUBBER CALENDER

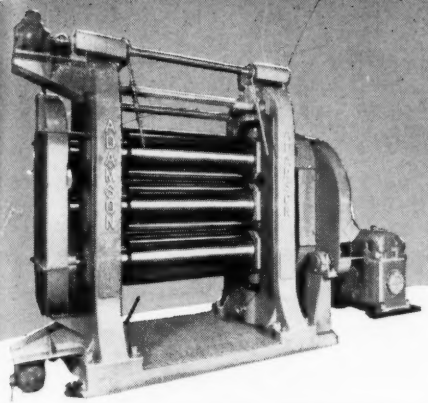
For high speed double-coating of tire fabric. Has sleeve bearings with grease or flood lubrication, motorized roll adjustments, herringbone connecting and drive gears, plus other features required for high speed production.

24" x 52" TWO-ROLL CALENDER

Another Adamson calender, vertical type, used in the production of floor tiling.

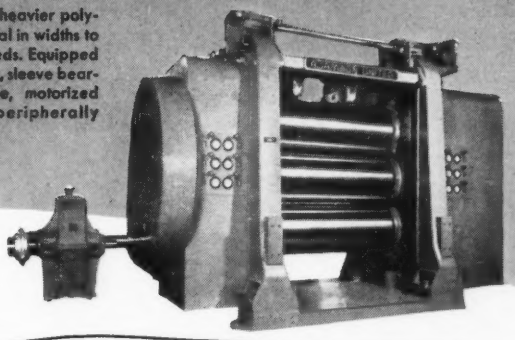






24" x 68" FOUR-ROLL STANDARD PLASTICS CALENDER

Produces 2 mil and heavier polyvinyl chloride material in widths to 57" at medium speeds. Equipped with flood lubrication, sleeve bearings, zero clearance, motorized roll adjustments, peripherally drilled rolls.



- for RUBBER and PLASTICS

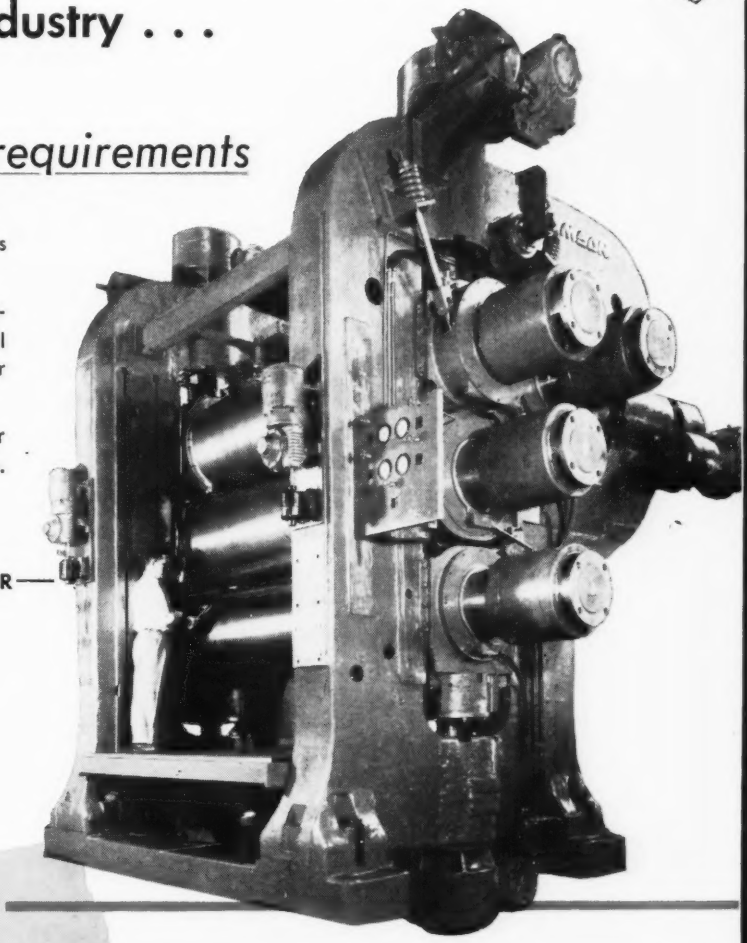
designed for the industry . . .

Engineered to your special requirements

Shown are some of the many types of calenders made to order for our customers.

Given product specifications and required maximum speed, we will design, build and install all basic and auxiliary equipment required for your complete manufacturing process.

We invite your inquiry concerning calendering or any other rubber or plastics processing problem.



32" x 92" FOUR-ROLL PRECISION CALENDER

This unit is geared to produce 72" wide vinyl film, 2 mils and less in thickness, at production speeds up to 150 YPM. It is equipped with anti-friction bearings, zero clearance, motor operated stock guides, motor operated roll crossing device, flood lubrication, universal couplings, pinion gear stand, drilled rolls and automatic temperature control. The electrical drive includes separate DC motors for each component, with speed trimming devices. Auxiliaries consist of embossing equipment, cooling unit and automatic turret-type windup.

ADAMSON UNITED COMPANY

730 CARROLL ST., AKRON 4, OHIO

A Name as old as the Rubber Industry

Branch Offices in Principal Cities

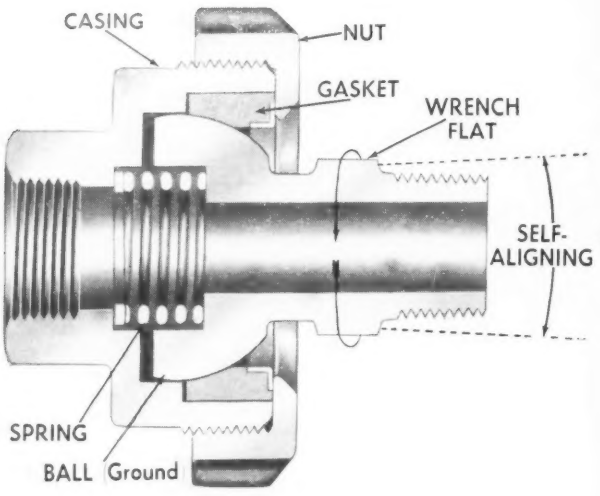
Subsidiary of United Engineering and Foundry Company

Plants at: Pittsburgh • Vandergrift • New Castle • Youngstown • Canton

BETTER MACHINES AND PROCESSES FOR BETTER RUBBEF AND PLASTICS PRODUCTS

FACTS

you should know about BARCO SWIVEL JOINTS



BARCO Swivel Joints incorporate the basic and *exclusive* advantages pioneered by Barco in a perfect sealing, self-aligning, single seat swivel joint. Barco Swivel Joints are *self-aligning* because of built-in flexibility which allows for angular or side motion up to 10°. This self-aligning feature eliminates slow, precise pipe fitting necessary with ordinary joints where binding and springing of the seal always tend to occur. It accommodates all ordinary irregularities — SAVES TIME, CUTS COSTS, INSURES PERFECT PERFORMANCE!

For complete information, check with Barco today. New catalog No. 265A contains detailed recommendations on selection and application of joints to meet your particular requirements.

BARCO *Manufacturing Co.*

510 E Hough Street, Barrington, Illinois

In Canada: The Holden Co., Ltd.

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints

12 ADVANTAGES!

1. **SELF-ALIGNING**—An original Barco design feature that provides angular flexibility.
2. **FASTER, EASIER INSTALLATION**—Because Barco Swivel joints are self-aligning, you save time on pipe fitting and installation.
3. **NO BINDING**—Barco joints properly installed don't bind or freeze—thanks to their built-in flexibility!
4. **NO LUBRICATION REQUIRED**—A worthwhile operating advantage.
5. **CHEMICALLY INERT SEAL**—Barco's new Service No. 11 CT gasket is amazingly long wearing and versatile.
6. **LOW TORQUE**—New gasket makes turning force very low.
7. **PERFECT SEALING—HOT OR COLD**—Spring loading automatically takes up wear and keeps joint tight regardless of pressure or temperature.
8. **PRESSURE-SAFE; FIREPROOF**—Joints have high safety rating and develop no dangerous pressure thrust. Available with all-metal construction (all steel if specified) for high temperature uses.
9. **ACCURATE POSITIONING OF LINES**—Eliminates the nuisance and hazards of sagging, flopping non-rigid lines. Ideal for "tied down" installations.
10. **EASY MAINTENANCE; LEAKPROOF**—You can't over-tighten the seal. Natural operating action keeps hemispherical ball lapped to a perfect fit.
11. **SMALL, LIGHT, COMPACT**—Barco offers a wide choice of sizes and styles to meet every need.
12. **ECONOMICAL**—Figure first cost with long, trouble-free life and YOU'RE AHEAD WITH BARCO SWIVEL JOINTS!

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Assuring Precision Results..

in RUBBER and PLASTICS

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*POLYCIZER 332 — Dioctyl Adipate
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Butyl Oleate
Dicapryl Phthalate — Odorless.
High-Purity
Dibutyl Phthalate
Didecyl Phthalate
Dioctyl Sebacate
Dibutyl Sebacate

*PLASTICIZER SC
*CELLUFLEX 112 — Dipheny! Cresyl
Phosphate
*LINDOL — Tricresyl Phosphates from
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*CELLUFLEX 179-C — Tricresyl
Phosphates from Petroleum Cresylic Acid
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Also a Complete Line of Softeners.

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STANTONE MBS (Masterbatch)
STANTONE GPE — Ground
Polyethylene
STANTONE PC — Paste
STANTONE Dry Pigment

STANTONE PVC — Polyvinyl Chloride
STANTONE RP — Vinyl Inks
STANTONE Rubber and Balloon Inks
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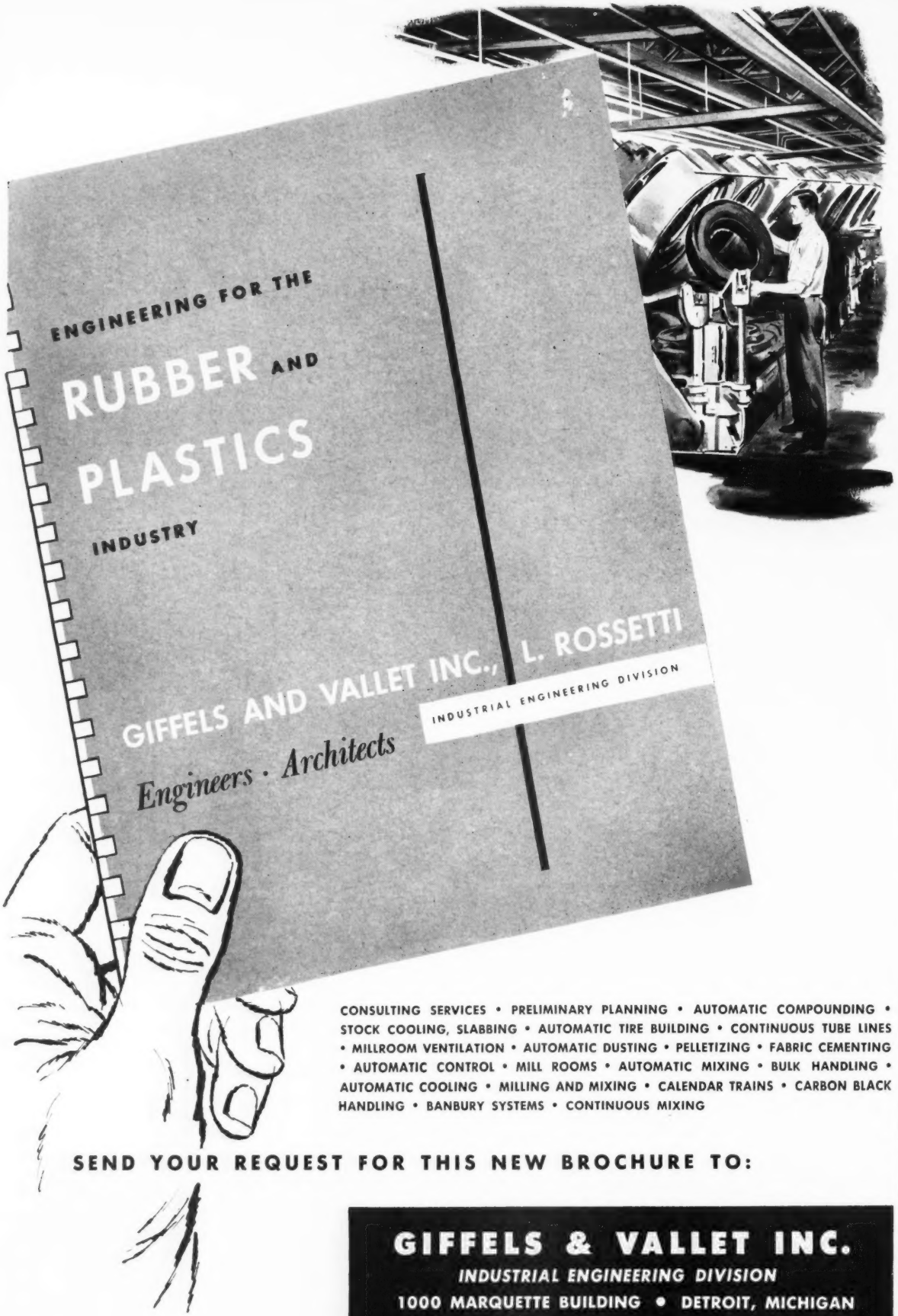

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● Banbury repairs require big facilities. Hale & Kullgren offer these facilities through association with The Aetna-Standard Engineering Company. This company installed more than $200,000 worth of special machine tools in their Warren, Ohio, plant for the specific purpose of repairing Banburys. These photos illustrate some of the actual Banbury repair work carried on in the big plant.

Repairing Banburys requires good craftsmanship, precision and accuracy. As specialists in metalworking for more than 50 years, Aetna-Standard has a superb reputation for expert work in the machinery business.

Hale & Kullgren adds the important know-how to Aetna-Standard's craftsmanship. H & K personnel have been associated with the rubber industry for as long as 30 years.

Much of the repair work requires building parts to the original. H & K have the patterns and can supply parts. In fact, most of them are carried in stock.

Call in Hale and Kullgren for fast, dependable Banbury repair service or rebuilding.

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613 E. Tallmadge Ave., Akron 10, Ohio
Phone: FRANKLIN 6-7161

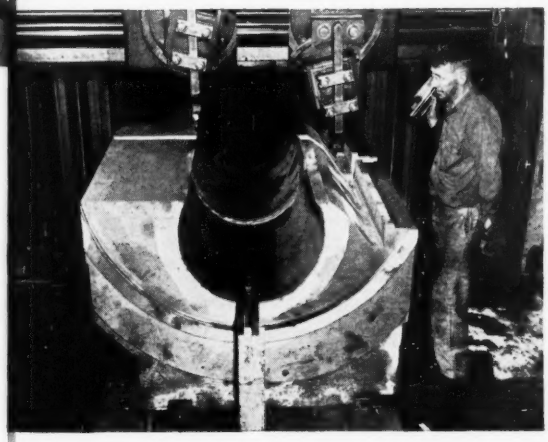
service on BANBURYS

OUR BIG SHOP HAS COMPLETE TOOLING FOR TOPNOTCH WORK

●When you need Banbury repair parts or rebuilding service, remember . . . you have a service practically at your back door.

The big Aetna-Standard plant at Warren, Ohio, sparkles with $200,000 worth of tools specifically installed for Banbury repair and rebuilding work.

When Hale & Kullgren announced their entry into the rubber and plastic machinery business three years ago, many friends said in effect — "I hope you intend to repair and rebuild Banburys. We need a service close to us."



In those three years, the Warren Plant has been busy with Banbury orders. Many midwest companies prefer the "close-to-home" service, so they can control progress of the work. They also like the personal treatment. Their maintenance men can follow the work closely in the shops and keep check on the progress of the work.

Parts do not offer a problem. Aetna-Standard has the patterns and build parts to the originals.

Another service in conjunction with repairing . . . Hale and Kullgren's engineers have been busy redesigning some of the basic Banbury parts. Several new ideas have been developed which might interest you. These changes do not interfere with the interchangeability. For example, one idea gives better control of leakage in the mixing chamber. That problem has been a bugaboo for many years in the Banbury business.

For expert service on your Banburys, remember the midwest service offered by Hale & Kullgren, specialists in designing and building rubber and plastic machinery.

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A SWAP SERVICE

In many cases, for quick service, a swap of parts can be made. You receive a rebuilt body with all parts up to standard and guaranteed. This swap of parts cuts your down time to a minimum.

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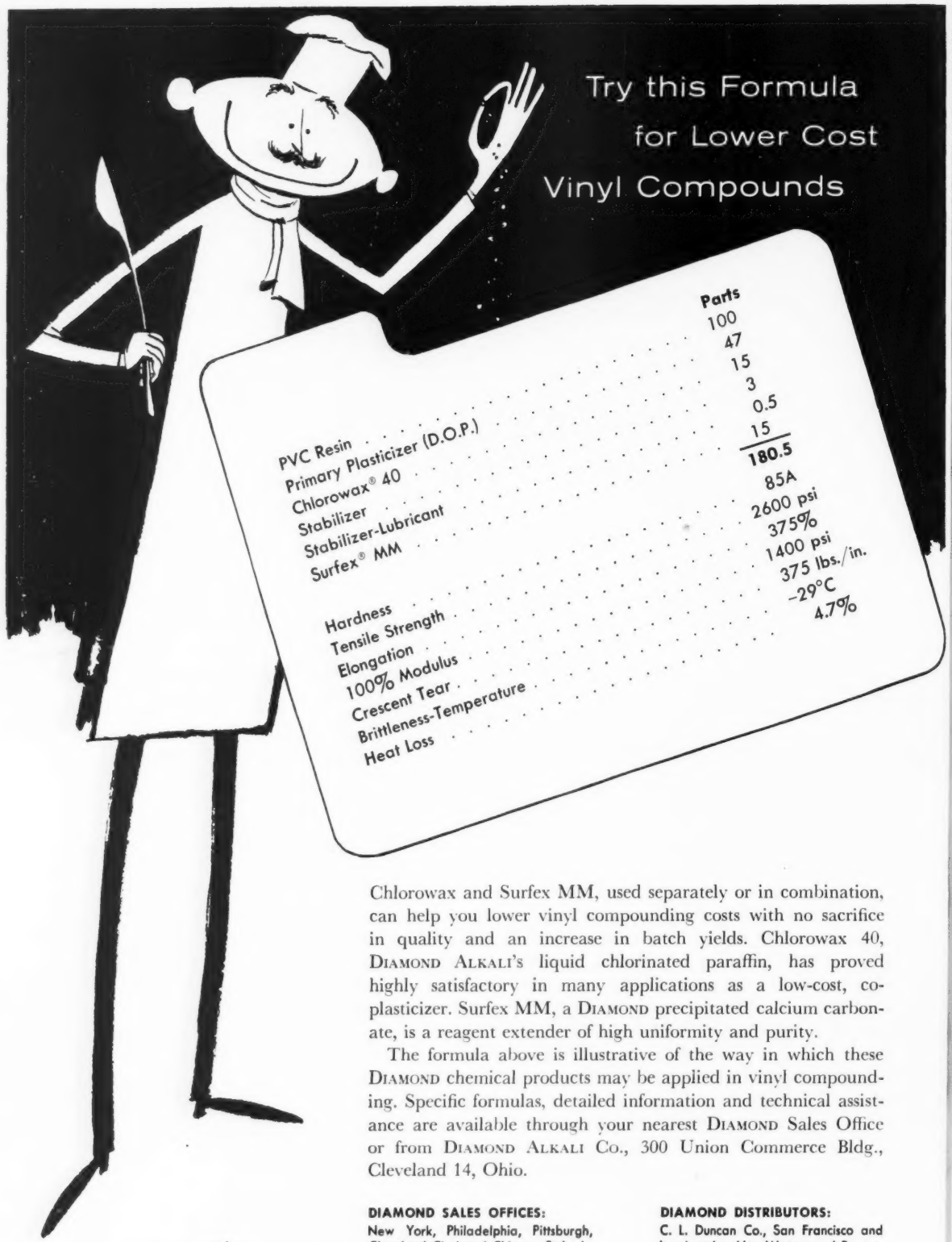

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UP TO
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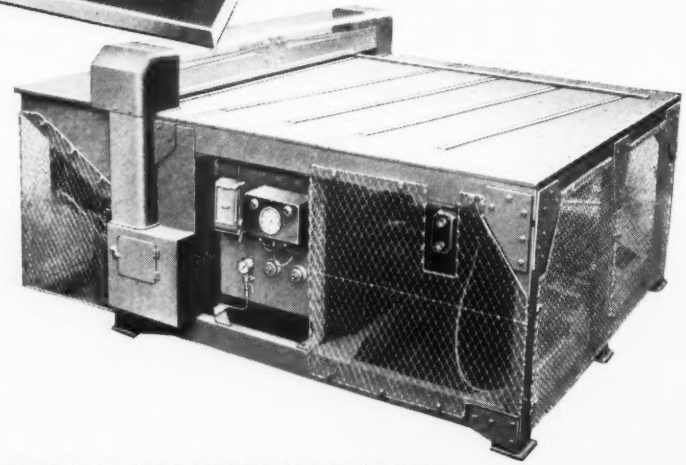

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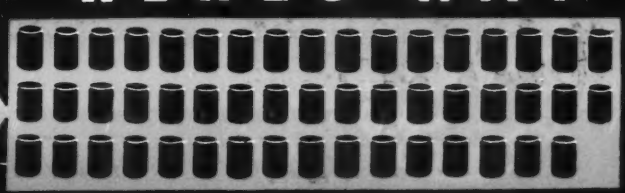

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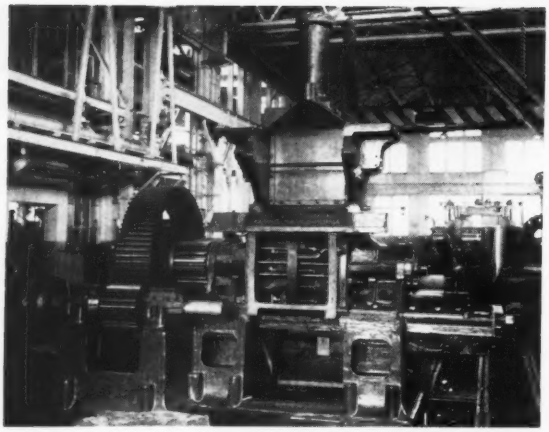

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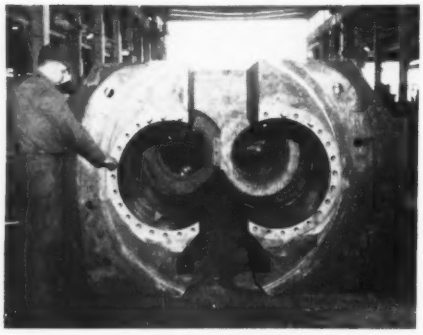
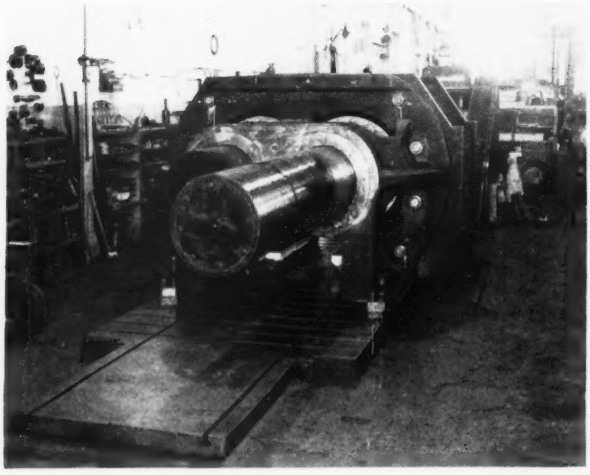
SAVES YOU TIME AND TROUBLE

↑ 29 Banbury rebuilt complete by INTERSTATE and reassembled in our plant for running in.

27 Banbury body rebuilt by INTERSTATE, reassembled and mounted on bed plate in our plant for customer to see it running. →





27 Side Jackets rebuilt by INTERSTATE. Jackets bored out and 2-inch high carbon steel sleeves inserted.

IT WILL PAY you to have your worn Banbury body rebuilt here. Rotors, side jackets, rings, bearings, end frames, thrust nuts, door top, connecting gears—ALL are worked over carefully by skilled, experienced Banbury men. Each worn part is accurately restored to its original size and contour and all wearing surfaces thoroughly hard-surfaced. New parts are used where necessary. The body is reassembled, painted and returned to you — good as new.

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(And maybe they will tomorrow. Who knows?)
You pick yourself up. You're unhurt.
Must have gone off some distance away.
Lucky that flying glass didn't get you.
Several fires out there in the plant.
Lots of casualties, too. Better get going.
Reach for the phone. It's dead. Well, you might have known.
Ambulances, fire engines, doctors, that's what you need.
And quick.
You've never needed help like you need it now.
But the same goes for everyone else in town.
Thank God Jones made all those people go to the first-aid classes.
Looks like they'll be the only help you'll get for hours.
Thank God they've got plenty of dressings, splints and stuff.
Remember when you got sore at Jones?
("All this stupid first-aid malarkey," you called it.)
Know better now, don't you?
Place looks like a tornado hit it.
Maybe that's what it was?
Whatever it was, better get busy.
There's plenty to do. Thank God you were ready.

Whatever the emergency is—you can be ready for it. That's just good business. Take these precautions TODAY.

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
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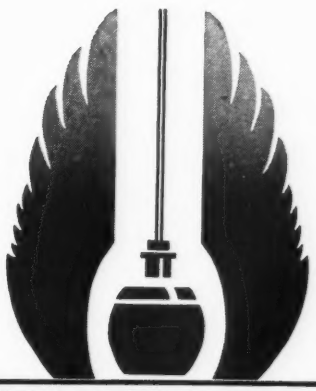

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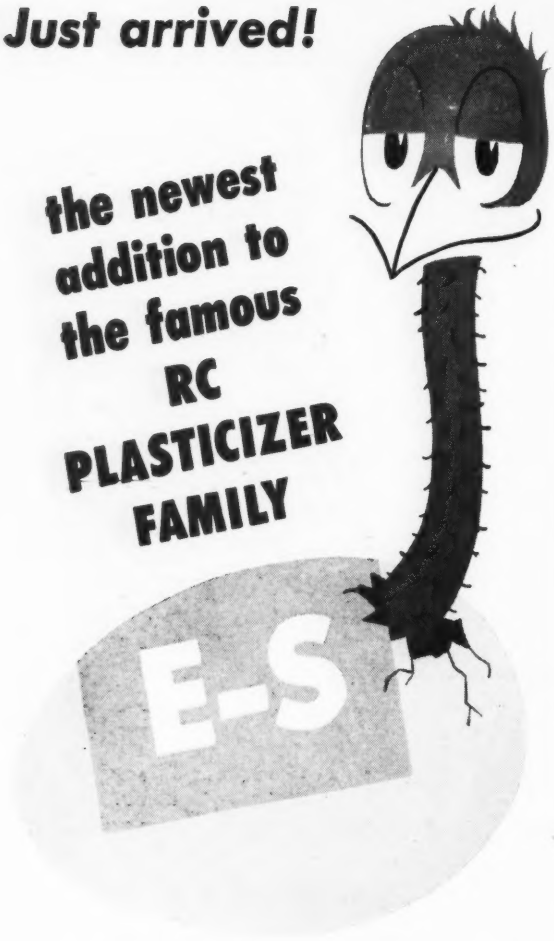

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The following results illustrate how "Thiokol" TP-90 B yields excellent low temperature flexibilities while still maintaining the physical properties:

	Natural Rubber	Neoprene GN	Hycar OR-15	Paracril-B	GR-S
TP-90B, p. h. r.	30	20	30	30	30
Cure, min. /° F.	30/310	45/300	30/310	30/310	30/310
Tensile, p. s. i.	2200	2600	2380	2250	1500
Elongation, %	530	410	300	350	380
Shore Durometer	42	68	70	61	45
Low Temperature Flexibility**	**–95°F**	**–70°F**	**–70°F**	**–80°F**	**–95°F**

**Determined according to a modification of ASTM method D 1043-49T. The temperatures shown are the values at which the absolute torsional moduli are 10,000 p. s. i. Although the specimens were still quite flexible, G10,000 was arbitrarily chosen as the stiffening point.

For technical information and samples, write:

This information is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data, or the use of this product.

Thiokol Chemical Corporation

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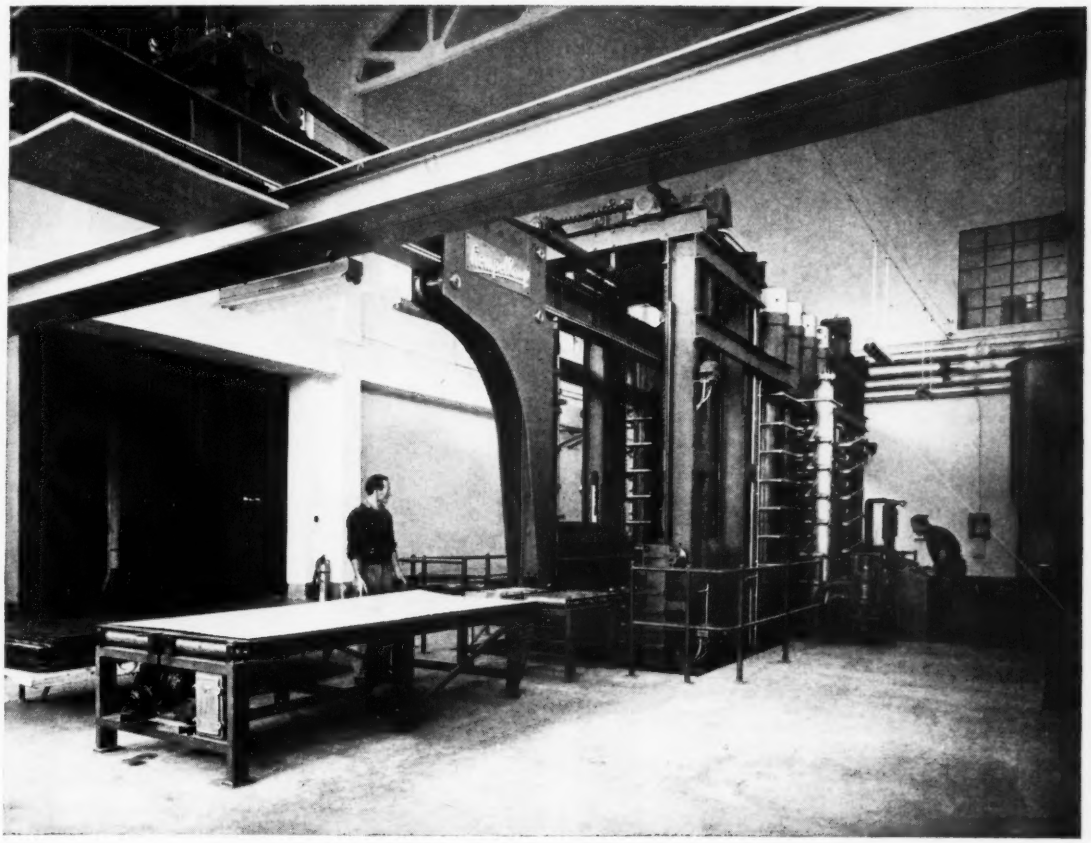

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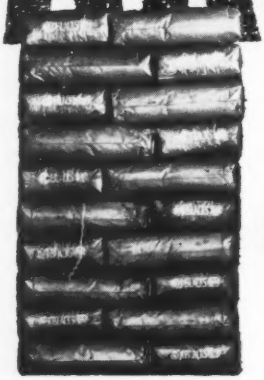

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RUBBER WORLD
A Bill Brothers Publication

APRIL, 1954
Vol. 130—No. 1

NBP EPA

SUBSCRIPTION PRICES
United States, $5.00 per year; Canada, $6.00; all other countries, $7.00. Single copies in the U. S., 50¢; elsewhere, 60¢.

Other Bill Publications are: In Marketing, SALES MANAGEMENT, SALES MEETINGS, PREMIUM PRACTICE. In Merchandising, FLOOR COVERING PROFITS, FOUNTAIN & FAST FOOD, GROCER-GRAPHIC, TIRES — TBA Merchandising, YANKEE FOOD MERCHANT.

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India RUBBER WORLD assumes no responsibility for the statements and opinions advanced by contributors.

A BILL BROTHERS PUBLICATION

Published monthly by
BILL BROTHERS PUBLISHING CORPORATION

Editorial and Executive
386 Fourth Ave.,
New York 16, N. Y.
LExington 2-1760

Office of Publication
1309 Noble St.,
Philadelphia 23,
Pennsylvania

Chicago Office: 333 N. Michigan Ave.
STate 2-1266

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Oxygen Absorption *versus* Conventional Aging of Commercial Vulcanizates

Louis R. Pollack[1]

PRESENT methods of evaluating aging resistance of rubber materials utilize a measurement of the changes in tensile strength and ultimate elongation that occur during aging for two days at elevated temperatures. This aging is carried out in air at either atmospheric or high pressure or in oxygen at high pressure.

Stock evaluations based on accelerated aging are made difficult by two principal factors. First, the great improvement in rubber stocks in recent years has made many specification aging requirements obsolete. Although the requirements may still represent acceptable minima, they do not rule out materials which age poorly by present-day commercial standards. The second difficulty is one which is inherent in the test methods themselves. During the short, two-day tests which are specified a major part of the observed change may be due to the effect of after-vulcanization. Very frequently, in fact, specimens are found to improve in physical properties during the test. Although it is true that materials may increase in tensile strength following fabrication, deterioration will occur after the cure is completed. If interest lies in the actual aging resistance of a material, increases in properties during the first part of accelerated aging are misleading; and it is difficult to draw conclusions which will give an insight into the behavior of the vulcanizate during the second aging period when oxygen aging is the predominant reaction.

A previous publication (1)[2] covered the investigation of aging characteristics of eight specially compounded stocks. Of the several possible correlations, the best one was found to be that between rate of oxygen absorption per gram of polymer and rate of loss of tensile strength in the oxygen bomb following the after-vulcanization period. As the rate of tensile loss should give a closer approximation to long service aging than a short (two day) test would, the absorption-tensile loss correlation was considered sufficiently important to warrant investigating the substitution of oxygen absorption measurements for the conventional bomb and oven tests.

TABLE 1. IDENTIFICATION OF STOCKS BY TYPE

Sample	Navy Dept. Specification	Class	Type	Specified Aging
1–3	33-R-4c	–	*Hevea*	Oven
4–8	33-H-4h	1	Chloroprene	Bomb
9–16	33-R-9	1	Chloroprene	Oven
17–30	33-R-9	2	GR-S	Oven
31–33	33-R-9	3	Nitrile	Oven
34	33-H-21	1	Chloroprene	Bomb

The present paper deals with the examination of 34 stocks of unknown composition furnished by various

THIRTY-FOUR commercial vulcanizates were aged in the oxygen bomb, the air oven, and by an oxygen absorption test.

Aging resistance in the bomb is evaluated more satisfactorily if physical property losses are measured only after the fourth day.

The oven test failed to evaluate aging resistance.

The oxygen absorption test provides a more fundamental and rapid evaluation of oxygen aging than do conventional tests.

[1] Industrial Laboratory, Mare Island Naval Shipyard, Vallejo, Calif.
[2] Numbers in parentheses refer to Bibliography items at end of this article.

commercial rubber manufacturers in the United States. The samples are identified in Table 1 according to specification and class (2-5).

Oxygen absorption and aging data were obtained in order to determine whether routine volumetric measurement of rates of oxygen absorption could be utilized as a rapid and comparatively non-destructive test which would be as adequate as those provided by conventional methods, to yield comparisons of commercially manufactured stocks.

Experimental Procedure

Tensile test specimens for each stock were die cut from sheets approximately six- by six- by 0.08-inch and arranged in groups of six, following a Latin square statistical pattern. Each sheet was divided into six positions, numbered from left to right. Each sextuplicate group was so chosen that no two specimens within the same group came from either the same sheet or the same numbered position on a sheet. This procedure equalizes effects due to non-uniform milling and temperature gradients while curing.

All stocks were aged in a Bierer-Davis pressure bomb at 70° C. and 300-psi. oxygen pressure for 48 hours and in a circulating air oven at 90° C. for 46 hours. In addition, eight of the stocks were bomb aged for extended periods of four, seven, and 14 days. Twenty-four hours after the expiration of the aging period, tensile strengths and ultimate elongations were measured in sextuplicate, utilizing all specimens in each group.

Specimens for determination of oxygen absorption rate were prepared in a Wiley mill by grinding a composite of the material remaining in the sheets after tensile specimens were cut from them. Duplicate absorption measurements were made at 120° C. on 1.5-gram specimens of the vulcanizates following previously described techniques (1). A detailed sketch of the absorption system is shown in Figure 1.

In a previous paper (1), no attempt was made to correct the absorption rate for pressure effects. The

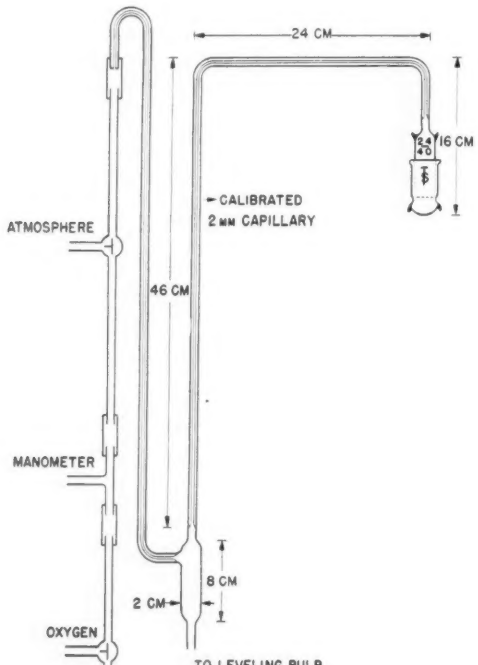

Fig. 1. Oxygen Absorption System Used

effect is small, but the correction is sufficiently simple to justify its use. If the rate is considered to be approximately proportional to the square root of the oxygen pressure (6), the equation for calculating oxygen absorption rate as standard milliliters per gram per hour becomes

$$\left(\frac{RF}{W}\right)\left(\frac{273.2}{T}\right)\left(\frac{P}{760}\right)\left(\frac{760}{P}\right)^{\frac{1}{2}}, \text{ or}$$

$$9.91\ RFP^{\frac{1}{2}}/WT$$

where R = oxygen absorption rate, mm. per hour
F = capillary calibration, ml. per mm.
P = atmospheric pressure, mm. of mercury
T = atmospheric temperature, °K
W = weight of sample, grams

Other portions of the composite were used for duplicate chemical analyses. Organic compounding ingredients were extracted with acetone and chloroform (7) and free carbon was determined by the method reported by Louth (8). Mineral matter was determined by ashing a one-gram specimen, first pyrolyzing gently and then completing the ignition at 800° C. Polymer was calculated by difference.

Test Results

Chemical Analysis

The chemical analyses of the various stocks are reported in Table 2. Separation of the vulcanizate into general fractions makes it possible to evaluate the percentage of polymer by difference. Although this procedure does not yield rigidly accurate values for polymer content, the approximation is good enough to allow calculation of oxygen absorption rates on the basis of polymer weight.

TABLE 2. CHEMICAL ANALYSES OF VULCANIZATES

Sample	Extractable Matter, %	Mineral Matter, %	Free Carbon, %	Polymer, %
1	6.6	6.1	0.0	87.3
2	6.9	6.7	0.0	86.4
3	3.2	22.0	0.0	74.8
4	11.3	16.8	26.3	45.6
5	9.0	3.9	44.5	42.6
6	11.0	2.8	42.8	43.4
7	7.6	4.9	39.6	47.9
8	11.0	11.7	37.0	40.3
9	14.8	4.6	28.6	52.0
10	21.7	4.0	19.1	55.2
11	14.6	5.0	14.8	65.6
12	19.1	5.2	19.8	55.9
13	14.6	5.3	22.2	57.9
14	15.2	5.4	3.1	76.3
15	8.6	3.8	0.0	87.6
16	13.8	3.9	13.4	68.9
17	21.2	4.6	23.2	51.0
18	21.6	6.2	23.8	48.4
19	20.7	3.9	24.6	50.8
20	21.7	3.0	30.1	45.2
21	17.9	3.0	27.8	51.3
22	23.2	12.9	23.0	40.9
23	14.2	3.6	24.4	57.8
24	20.2	3.7	26.3	49.8
25	25.7	9.4	18.2	46.7
26	14.7	4.0	30.5	50.8
27	23.1	4.4	28.0	44.5
28	27.7	4.3	22.0	46.0
29	14.5	5.4	30.0	50.1
30	18.1	3.7	27.2	51.0
31	21.7	3.4	22.3	52.6
32	17.7	5.2	30.2	46.9
33	22.0	6.6	20.6	50.8
34	6.9	16.2	26.8	50.1

Oxygen Absorption

The results of the oxygen absorption measurements have been expressed as standard milliliters of oxygen absorbed per gram of material per hour. These rates have been calculated on two sample bases: the total weight of vulcanizate, and the weight of polymer in the specimen. Table 3 gives the oxygen absorption results based on weight of vulcanizate, and Table 4 gives the results based on weight of polymer. The Table 4 results

are rounded values obtained by dividing the mean rates in Table 3 by the respective fraction of polymer shown in Table 2.

TABLE 3. OXYGEN ABSORPTION RATES BASED ON VULCANIZATE

Sample	Oxygen Absorbed, Std. Ml. per Hr. per G.	Mean	Standard Deviation
1	0.207 0.205	0.206	0.0014
2	0.249 0.239	0.244	0.0071
3	0.231 0.229	0.230	0.0014
4	0.227 0.231	0.229	0.0028
5	0.094 0.094	0.094	0.0000
6	0.239 0.249	0.244	0.0071
7	0.239 0.240	0.240	0.0007
8	0.171 0.178	0.174	0.0050
9	0.090 0.081	0.086	0.0064
10	0.152 0.156	0.154	0.0028
11	0.121 0.119	0.120	0.0014
12	0.083 0.080	0.082	0.0021
13	0.189 0.181	0.185	0.0057
14	0.236 0.232	0.234	0.0028
15	0.198 0.193	0.196	0.0035
16	0.208 0.212	0.210	0.0028
17	0.257 0.253	0.255	0.0028
18	0.467 0.445	0.456	0.0155
19	0.129 0.120	0.124	0.0064
20	0.241 0.232	0.236	0.0064
21	0.118 0.116	0.117	0.0014
22	0.394 0.384	0.389	0.0071
23	0.189 0.202	0.196	0.0092
24	0.199 0.209	0.204	0.0071
25	0.331 0.335	0.333	0.0028
26	0.097 0.091	0.094	0.0042
27	0.194 0.186	0.190	0.0057
28	0.272 0.260	0.266	0.0085
29	0.166 0.173	0.170	0.0050
30	0.136 0.138	0.137	0.0014
31	0.198 0.194	0.196	0.0028
32	0.129 0.127	0.128	0.0014
33	0.312 0.326	0.319	0.0099
34	0.189 0.176	0.182	0.0092
Of individual sample			0.0057

In addition to the individual determinations and mean values, Table 3 includes standard deviations in order to show the precision of the method. Standard deviations for the method were calculated from all of the data by two methods. The classical statistical method yielded $\sigma = 0.0057$ for a single determination. The procedure outlined by Heide (9) for measuring precision in the absence of a standard sample gives $\sigma = 0.0058$. The close agreement indicates a normal distribution of the differences between duplicate determinations. An estimate of the

TABLE 4. OXYGEN ABSORPTION RATES BASED ON POLYMER

Sample	Oxygen Absorbed, Std. Ml. per Hr. per G.	Sample	Oxygen Absorbed, Std. Ml. per Hr. per G.
1	0.24	17	0.50
2	0.28	18	0.94
3	0.31	19	0.24
4	0.50	20	0.52
5	0.22	21	0.23
6	0.56	22	0.95
7	0.50	23	0.34
8	0.43	24	0.41
9	0.16	25	0.71
10	0.28	26	0.18
11	0.18	27	0.43
12	0.15	28	0.58
13	0.32	29	0.34
14	0.31	30	0.27
15	0.22	31	0.37
16	0.30	32	0.27
		33	0.63
		34	0.36

TABLE 5. EFFECT OF BOMB AND OVEN AGING ON TENSILE STRENGTH

Sample	Original PSI.	After Aging: Bomb PSI.	After Aging: Oven PSI.	Tensile Loss, % of Original: Bomb	Tensile Loss, % of Original: Oven
1	3400	3440	3440	+1.2*	+1.2*
2	3850	3680	3640	4.4	5.5
3	3050	2770	3040	9.2	0.3
4	1670	1540	1680	7.8	+0.6*
5	2090	2000	2230	4.3	+6.7*
6	1970	1870	2030	5.1	+3.0*
7	2130	2020	2290	5.2	+7.6*
8	1820	1740	1890	4.4	+3.8*
9	2150	2090	2220	2.8	+3.3*
10	2040	2050	2320	+0.5*	+13.7*
11	2410	2620	2800	+8.7*	+16.2*
12	1740	1720	1950	1.1	+12.1*
13	2030	1890	2010	6.9	.0
14	2250	2170	2480	3.6	+1 .2*
15	3600	3650	3700	+1.4*	+2.8*
16	2180	2010	2180	7.8	0.0
17	1610	1570	1740	2.5	+8.1*
18	2140	1780	2020	16.8	5.6
19	1200	1160	1570	3.3	+30.8*
20	1660	1450	1310	12.6	21.1
21	2080	1940	2140	6.7	+2.9*
22	1380	1290	1570	6.5	+13.8*
23	1570	1420	1640	9.6	+4.5*
24	1140	1100	1020	3.5	10.5
25	940	990	1000	+5.3*	+6.4*
26	1330	1320	1440	0.8	+8.3*
27	1470	1440	1620	2.0	+10.2*
28	960	980	920	+2.1*	4.2
29	1540	1440	1670	6.5	+8.4*
30	1620	1260	1310	22.2	19.1
31	2320	2310	2750	0.4	+18.5*
32	1740	1700	1650	2.3	5.2
33	1630	1640	1860	+0.6*	+14.1*
34	1600	1540	1660	3.8	+3.8*

*Tensile strength increased.

TABLE 6. EFFECT OF BOMB AND OVEN AGING ON ULTIMATE ELONGATION

Sample	Original %	After Aging: Bomb %	After Aging: Oven %	Elongation Loss, % of Original: Bomb	Elongation Loss, % of Original: Oven
1	710	700	660	1.4	7.0
2	760	760	730	0.0	3.9
3	780	770	765	1.3	1.9
4	360	355	330	1.4	8.3
5	260	260	260	0.0	0.0
6	285	280	280	1.8	1.8
7	390	385	380	1.3	2.6
8	360	360	340	0.0	5.6
9	610	595	580	2.5	4.9
10	570	580	585	+1.8*	+2.6*
11	770	815	845	+5.8*	+9.7*
12	695	685	700	1.4	+0.7*
13	540	555	520	+2.8*	3.7
14	780	760	760	2.6	2.6
15	920	900	850	2.2	7.6
16	710	680	660	4.2	7.0
17	370	370	370	0.0	0.0
18	535	510	450	4.7	15.9
19	360	350	380	2.8	+5.6*
20	720	655	540	9.0	25.0
21	530	480	470	9.4	11.3
22	380	350	310	7.9	18.4
23	565	520	500	8.0	11.5
24	350	340	255	2.9	27.1
25	570	550	470	3.5	17.5
26	460	460	440	0.0	4.4
27	610	560	550	8.2	9.8
28	360	350	290	2.8	19.4
29	530	450	440	15.1	17.0
30	480	365	330	24.0	31.2
31	465	460	450	1.1	3.2
32	735	720	650	2.0	11.6
33	450	450	370	0.0	17.8
34	480	480	455	0.0	5.2

*Elongation increased.

precision may be obtained by comparing the calculated standard deviation with the absolute absorption rates in Table 3. The standard deviation of the mean of replicates will be smaller by a factor equal to the square root of the number of replicates (10). Thus, the standard deviation of the mean of triplicate determinations will be 0.0033.

Aging Tests

The tensile strengths before and after aging in the bomb and oven, and percentage change of original tensile in both bomb and oven are shown in Table 5. It is interesting to note that a majority of all samples examined increased in tensile strength when subjected to the specified aging test shown in Table 1. Table 6 is constructed in a manner analogous to Table 5. Elongations before and after aging in the bomb and the oven are shown, as well as percentage change of original elongation in both bomb and oven. In general, a fairly good distribution of loss of elongation was obtained.

Tables 7 and 8 show the changes in tensile strengths and ultimate elongations, respectively, following extended periods of bomb aging. The tables give the physical property values after each aging period and the total loss suffered during 14 days of aging. Also included are rates of loss, reported as loss of physical property per day, both on the absolute and percentage basis. For the purpose of establishing comparative rates, the initial period was ignored, and only the period from four to 14 days was considered. Loss rates were calculated from the least squares solution for the best straight line through the four-, seven-, and 14-day points.

TABLE 7. EFFECT OF PROTRACTED BOMB AGING ON TENSILE STRENGTH

	PSI. after Days in Bomb					Total Loss after 4th Day*		Loss per Day after 4th Day*	
Sample	0	2	4	7	14	PSI.	% of Orig.	PSI.	% of Orig.
1	3400	3440	3620	3110	3020	380	11	52	1.5
3	3050	2770	2780	2750	2050	1000	33	78	2.6
5	2090	2000	1900	1930	1800	290	14	12	0.6
6	1970	1870	1730	1740	1580	390	20	16	0.8
18	2140	1780	1690	1600	1530	610	28	15	0.7
24	1140	1100	1050	940	900	240	21	13	1.1
25	940	990	920	840	800	140	15	11	1.2
26	1330	1320	1340	1330	1340	+10†	+1†	0	0.0

*Least-squares slope through 4-, 7-, and 14-day points.
†Tensile strength increased.

TABLE 8. EFFECT OF PROTRACTED BOMB AGING ON ULTIMATE ELONGATION

	% after Days in Bomb					Total Loss after 4th Day*		Loss per Day after 4th Day*	
Sample	0	2	4	7	14	%	% of Orig.	%	% of Orig.
1	710	700	690	660	650	60	8	3.6	0.5
3	780	770	750	770	750	30	4	0.5	0.1
5	260	260	260	270	260	0	0	0.2	0.1
6	285	280	280	260	250	35	12	2.7	1.0
18	535	510	445	415	390	145	27	5.2	1.0
24	350	340	270	220	260	90	26	+0.2†	+0.1†
25	570	550	500	440	410	160	28	8.2	1.4
26	460	460	430	360	290	170	37	13.3	2.9

*Least-squares slope through 4-, 7-, and 14-day points.
†Positive slope.

Discussion

Conventional Aging Tests

It should be observed that although the usual aging tests are used to provide an evaluation of aging resistance, certain unfavorable factors exist which reduce the value of such tests considerably. A large majority of the samples, a total of 24 out of 34, increased in tensile strength during oven aging. Seven samples showed tensile increases during bomb aging. Only four samples increased in elongation during oven aging, and three during bomb aging. Overall, a good distribution of elongation changes was found.

It becomes apparent that the aging test used has a decided effect on the value of the aging data. Elongation changes may be correlated to some extent between bomb and oven aging. However, the bomb test causes a general deterioration of tensile strength while the oven test does not. This point raises the question: Does the short-term oven aging test evaluate, even qualitatively, the property it was designed to measure?

The effect of aging time on stock evaluation is worth considering. Table 9 presents the data of Tables 7 and 8 in the form of % of original property lost during each bomb aging period. It may be seen that the relative ranking of stocks depends on the aging period chosen. This is primarily due to the fact that different stocks show different types of behavior during the initial period of bomb oxidation. It would be advantageous to be able to evaluate stocks during a period in which they behave predictably. Such a period is found following the fourth day, by which time all stocks investigated in detail began to show a reasonably linear property decrease.

TABLE 9. EFFECT OF PROTRACTED BOMB AGING ON PHYSICAL PROPERTIES

	Loss in % of Original					
	After Days in Bomb				4-14 Days	
Sample	2	4	7	14	Total	Per Day
	Tensile Strength					
1	−1*	+6*	9	11	18	1.8
3	9	9	10	33	24	2.4
5	4	9	8	14	5	0.5
6	5	12	12	20	8	0.8
18	17	21	25	28	7	0.7
24	4	8	18	21	13	1.3
25	+5*	2	11	15	13	1.3
26	1	+1*	0	+1*	0	0.0
	Ultimate Elongation					
1	1	3	7	8	6	0.6
3	1	4	1	4	0	0.0
5	0	0	4	0	0	0.0
6	2	2	9	12	11	1.1
18	5	17	22	27	10	1.0
24	3	23	37	26	3	0.3
25	4	12	23	28	16	1.6
26	0	7	22	37	30	3.0

*Tensile strength increased.

Although tensile-time curves are not actually straight lines, the degree of practical approach to linearity may be estimated by examining the last columns of Tables 7, 8, and 9. The first two tables give the rate of loss per day of tensile strength and ultimate elongation, respectively, as calculated from the least squares solution for the best straight line through the four-, seven-, and 14-day points. Table 9 gives the loss rates as the total loss between four and 14 days, divided by the number of days. Comparing the last columns of Tables 7 and 8 with the last column of Table 9, it is evident that the two methods of approach yield virtually identical results. This shows that when rate of property loss in the bomb is desired, it is sufficient, for all practical purposes, to measure properties after four and 14 days of aging.

The problem of different stock evaluations by different accelerated aging methods may be reduced to the question of what reactions are being studied. If it is postulated that most aging curves show a slight increase in property, pass through a maximum, and then decrease regularly, it becomes very important to separate the two factors involved. Although deterioration progresses from the first, the initial effect is predominantly a property increase due to additional vulcanization or polymerization. After the initial effect has been reduced almost to zero, the second stage, which shows deterioration only, should be a measure of aging resistance.

Difficulties in correlating different laboratory aging procedures may well be due to the relative weights given

to the importance of the curing stage. With little or no acceleration of aging, such as in air oven or shelf aging, the end of the test period frequently finds the material in the first stage of the aging curve. Even if the maximum has been passed, the decrease may not yet have reduced the value of the property to the original, and the test will show a property increase. A more highly accelerated test, such as the oxygen bomb, more frequently passes this stage and shows a property decrease, but the initial period will nevertheless have been included in the evaluation. A four- to 14-day bomb test eliminates the initial part of the curve and measures the second, oxidation phase only. Similarly, an oxygen absorption test measures only the rate at which oxygen is being absorbed and, in the absence of side reactions or reducing agents, should also give a measure of the second part of the aging curve.

Oxygen Absorption

Generally, there is a fair qualitative correlation between oxygen absorption rate and tensile loss rate in the bomb. With the exception of Stock 18, which is rated as poor by oxygen absorption and good by the long bomb test, stocks containing the same polymeric base are ranked similarly by the two tests. The correlation becomes poorer when attempts are made to compare different types of elastomers.

The desire to find a quantitative correlation between oxygen absorption rate and some measure of loss of physical property is a natural one. However, even if no correlation existed, an oxygen absorption test should be considered on its own merits. Oxidizability is a reproducible chemical property which measures the rate at which an elastomer reacts with molecular oxygen. Since oxidation is the principal cause of rubber deterioration, oxidizability becomes an important property. Although reaction with oxygen does not invariably lead to destructive mechanisms such as chain scission, it is obvious that oxidative degradation of the rubber molecule cannot occur without utilization of oxygen. Additional absorption of oxygen may be due to the presence of oxidizable compounding ingredients. However, if oxidizability is low, there is assurance that there is insufficient reaction with oxygen to cause excessive deterioration of physical properties. In other words, a low rate of oxygen absorption means good aging resistance.

Objections to an oxygen absorption test are based on the fact that oxidizability does not correlate quantitatively with oxygen bomb and air oven tests, and that at the high temperature required to perform the absorption test rapidly the oxidation mechanism may be different from that at service temperatures. As long as relative results of the bomb test vary with the length of the test, it seems best not to attach fundamental significance to the results obtained during a test of fixed duration. In fact, there is reason to believe that rate of property loss in the bomb is a better aging criterion than is the test presently used. As for the oven test, the data in this paper indicate that a short test fails entirely to measure relative aging resistance. This evidence further substantiates the findings of Shelton and Cox (11) that the effect of cure is so pronounced in the case of the oven test that results may be seriously obscured. In the face of these considerations, it should not be expected that a quantitative correlation would exist between the standard physical aging tests and a fundamental chemical test.

The objection relating to high temperatures is of another nature. If oxidation mechanisms do change seriously, some difficulty will occur in comparing different materials; but with vulcanizates which are similar, mechanism changes would also be expected to be similar, and valid comparisons could still be made. Shelton and coworkers (12) have found that there is no appreciable change in mechanism between 50 and 110° C. for natural rubber and between 50 and 150° C. for GR-S. No adequate information is available for other polymers.

Conclusions

The information in this paper appears to warrant certain conclusions:

The oven test, when performed on present-day commercial vulcanizates, fails to evaluate aging resistance alone, but measures the resultant of after-vulcanization and degradation effects. Further, inordinate weight is given to the after-vulcanization effect.

In the bomb test, rate of loss of physical properties during the constant rate stage should provide a better evaluation of aging resistance than does the total loss during the first two days. The total loss of physical properties between the fourth and the fourteenth day in the bomb may be used as a substitute for the rate of loss.

Oxygen absorption rate, because of the nature of the chemical reactions involved, provides a more fundamental and rapid evaluation of the oxygen aging of a vulcanizate than do present tests.

Acknowledgment

The author wishes to thank the Bureau of Ships, U. S. Navy Department, for sponsoring this work and for permitting publication of the results. All views expressed, however, are those of the author and do not necessarily represent the official views of the Navy Department. Thanks are due to M. Lew for the chemical analyses and to H. Moser and A. W. Scott for the many physical results reported. The cooperation of almost a score of manufacturers in the American rubber industry in supplying the samples which made this investigation possible is greatly appreciated.

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(6) J. R. Shelton, W. L. Cox, *Ind. Eng. Chem.*, 45, 392 (1953).
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Pump Rod Cups

THE use of pump rod cups made of Hycar rubber and a phenolic resin extends the continuous operating life of oil-well pumps by as much as three months by maintaining a tight seal in the pump barrel long after other cups would fail, according to The Dragon Mfg. Co., Marietta, O., producer of the item.

Worn cups result in decreased efficiency of the pump, and their replacement requires production shutdown and the use of labor. To increase the life of the rod cups, the company searched for a compound highly resistant to abrasion and unaffected by oil and other materials commonly found in oil wells. Hycar, a product of B. F. Goodrich Chemical Co., Cleveland, O., reportedly meets these requirements and imparts to the cups the necessary flexibility. By combining the Hycar with a phenolic resin, a product is obtained which performs satisfactorily.

A Precise Method for the Determination of the Width of a Dumbbell Test Specimen[1]

B. G. Labbe[2] and H. M. Leeper[2]

THE inaccuracy of stress-strain data in testing rubber samples is undoubtedly increased by variations in the width of the constricted area of the dumbbell test specimen. Frequently a die for cutting these test specimens is purchased and put into service without checking the width of the resulting dumbbell specimen. This situation often develops because of the uncertainty of the methods used for width determinations and the lack of suitable equipment for making the determinations, such as the cathetometer (microscope mounted on rod with cross wires and a scale).

The cathetometer will provide more accurate results than either the micrometer or the thickness gage, but is open to the following objections:

1. The edge of the specimen is not always a well-defined line at the magnification necessary, and measurements made on a single strip will vary with each observer.
2. Shadows must be completely eliminated because lighting of the sample is critical.
3. If the edges of the strip are not perpendicular to its lateral surfaces, recognition of the upper edge becomes difficult and uncertain.
4. If the sides of the specimen are slightly concave, as is sometimes the case, the cathetometric method will yield false results that are high.

The method presented herein for the more precise determination of the width of a dumbbell test specimen requires no special apparatus. Any suitable method for determining specific gravity to the third decimal place, an analytical balance, and a standard thickness gage are all that is required for this method. It is carried out in the following manner:

1. A single specimen is cut in the center of a six- by six- by 0.075-inch slab with the die being used. With the length of the die at a 90-degree angle to the length of the previously cut specimen (which has been placed back in the slab), three cross-cuts are made in the constricted area length. (See Figure 1.) Each cut is made with that part of the die which corresponds to the portion of the constricted area length of the original strip now being cut. All of the cut pieces are fitted back into the slab after each cut to keep the die level and to prevent as much distortion of the pieces as possible.
2. The thickness of each of the three square pieces from the constricted area of the specimen is estimated to the nearest 0.0001 of an inch with the standard rubber thickness gage.
3. Each of the three square pieces is measured on an analytical balance to the nearest 0.1-milligram.
4. The specific gravity of the slab rubber being tested should be determined to the third decimal place.
5. The width of the dumbbell specimen is calculated by using the following equation:

$$\text{Width} = \sqrt{\frac{\text{weight}}{\text{thickness} \times \text{sp. gr.}}}$$

The data in the table show constricted area widths of various types of compounds determined with the cathetometer and the proposed weighing method.

SPECIMEN WIDTHS BY CATHETOMETER AND WEIGHT METHODS

Polymer	Black P.H.R.	Constricted Area Cathetometer* Method	Widths (Inches) Weight† Method
GR-S	30	0.2490	0.2513
	40	0.2505	0.2505
	50	0.2492	0.2498
	60	0.2481	0.2484
	70	0.2471	0.2471
GR-M	None	0.2504	0.2521

*Average of 10 readings, five on each side of specimen.
†Average of three determinations.

Variations of the 10 readings with the cathetometer ranged from 1.0 to 2.7% for the individual specimens; while the three readings by the cutting method varied from 0.1 to 0.6%.

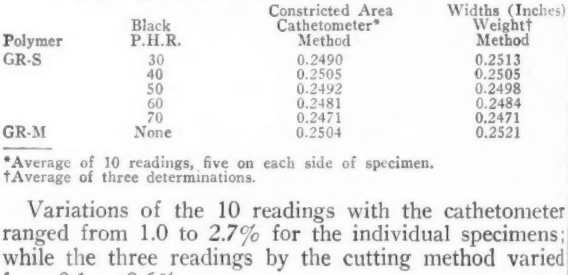

Fig. 1. Original Dumbbell Specimen (Vertical) and Location of the Three Cross-Cuts of Restricted Area Are Shown

[1] The work discussed herein was performed as a part of the research project sponsored by the Reconstruction Finance Corp., Office of Synthetic Rubber, in connection with the Government Synthetic Rubber Program.
[2] Government laboratories, University of Akron, O.

The Effect of Various Surface Treatments on the Reinforcement and Rate of Cure of Silica Loaded Stocks[1]

Walter R. Hausch[2]

HEAT treatment at 800° F. and/or the addition of glycols or amines has been found capable of modifying the surface of silica-type pigments used in the compounding of natural and synthetic rubber.

Such treatment results in better tensile reinforcement and improved modulus at lower accelerator levels in the compounds.

COLLOIDAL silicas have been used in rubber for only a short period of time. Those now available on the market as solids fall into two main classes—the thermal silicas which are essentially pure silica and the precipitated silicas which are really silica gels. The thermal silicas are usually mildly acid and, therefore, retard cures. The precipitated silicas can be made with almost any pH value, but are usually made slightly alkaline. These precipitated silicas, however, are like the normal silica gels and have a very adsorptive surface. They ordinarily contain about 5% bound water, and Shapiro and Weiss, using the new diborane method, found that the bound water in such silicas is held as hydroxyl groups.[3]

The present investigation was begun to determine the adsorption characteristics of the precipitated silicas and to determine how these characteristics might be modified. Previous investigators studying clays for possible use as rubber pigments used diphenyl-guanidine or dye adsorption as a measure of the adsorptive capacity of the clays on rubber accelerators.[4, 5] These methods were used to separate the various clays into rubber and non-rubber grades. The same methods were used in this investigation to study the change in the adsorptive characteristics of silica when subjected to various treatments.

DPG Adsorption

In order to determine the adsorption characteristics of the colloidal silicas, a diphenylguanidine adsorption test was run. A 0.01 N solution of DPG in methanol was prepared (2.113 g./l.). Five-gram samples of the pigments investigated were treated with 100-milliliter portions of the DPG solution. After one hour the supernatent liquid was filtered off, and a 25-milliliter aliquot titrated with 0.01 N hydrochloric acid using bromphenol blue indicator. The results are given in Table 1.

[1] Presented before the Division of Rubber Chemistry, A. C. S., Chicago, Ill., Sept. 9, 1953. Contribution of the chemical and physical research laboratories, Firestone Tire & Rubber Co.

[2] Firestone Tire & Rubber Co., Akron, O.

[3] *J. Phys. Chem.*, 57, 214 (1953).

[4] "Kaolin Clays and Their Industrial Uses." J. M. Huber Corp., New York (1949).

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TABLE 1. DPG ADSORPTION BY VARIOUS SILICAS

Sample	DPG Adsorbed Grams/100 G. of Pigment	DPG Adsorbed, %
Precipitated silica, Source No. 1	0.138	3.29
Precipitated silica, Source No. 1 After 1½ hours at 1600° F.	0.060	1.43
Precipitated silica, Source No. 2	0.347	8.25

TABLE 2. MALACHITE GREEN DYE ADSORPTION FROM AQUEOUS SOLUTION BY VARIOUS SILICAS

Sample	Dye Adsorbed, %
1. Precipitated silica, Source No. 1 (25 mμ diameter)	99.6
2. Precipitated silica, Source No. 2 (25 mμ diameter)	99.9
3. Thermal silica	10.0
4. Precipitated silica (100 mμ diameter)	45.0
5. Shattered silica gel	85.0
6. Clay—rubber grade	96.2

As the data show, there is little DPG adsorption by the silicas. These differ from the clays, some of which show much higher adsorption. Even rubber grade clays may adsorb as much as 30% of the DPG present. Many of the clays, however, are acid in nature and have a high KOH adsorption. The highly alkaline DPG would be expected to be adsorbed in like manner. The precipitated silicas studied were slightly alkaline (pH 8.0-8.5). This may account for the lower adsorption.

One reference[4] states that the adsorptive capacity of clays for DPG is no indication of the rate of cure of clay loaded stocks using other organic accelerators of different types.

Dye Adsorption

Thies[5] showed that the effect of clays on the curing rate of rubber stocks could be anticipated by a study of their dye adsorption characteristics. Those clays with high adsorption resulted in severely retarded cures which may have been due to the accelerator adsorption by these clays.

It was found that dye adsorption was very high for some of the precipitated silicas, reaching almost 100% adsorption for the finest ones studied (Table 2). In contrast, a thermal silica of even smaller particle size showed only 10% dye adsorption. These adsorption studies were made using five-gram samples of pigment which were shaken with 100 milliliters of 0.1% malachite green aqueous solution for 18 hours. The high dye adsorption, measured with a Klett-Summerson photoelectric colorimeter, is reflected by the high accelerator requirements of most colloidal silicas.

Such close correlation with actual compounding experience was obtained in initial studies with malachite green dye adsorption that the investigation was expanded to cover the effects of various heat treatments and the use of many compounding ingredients.

Thermal Treatment

In this work it was found that dye adsorption could be reduced by heating the precipitated silicas. Figure 1 is a graph of the malachite green dye adsorption from an aqueous solution *vs.* the temperature of heating. It will be noticed that precipitated silica, dried at 212° F., has high dye adsorption, but further heating at temperatures as low as 300° F. reduced the degree of dye adsorption.

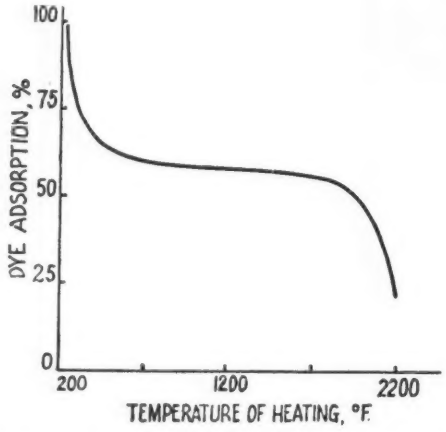

Fig. 1. Influence of Heat on Dye Adsorption of Silica-Type Pigments. Note Adsorption Reduced Beginning at 300° F.

Figure 2 shows the correlation of the malachite green dye adsorption from 0.1% chloroform solution with the heat of wetting and surface area of silica gels as taken from the literature. A chloroform instead of an aqueous solution was used so as to duplicate more nearly the conditions in a rubber stock. The top curve represents the heat of wetting with water of various silica gels heated for two hours over a range of temperatures, as determined by Bartell and Almy.[6]

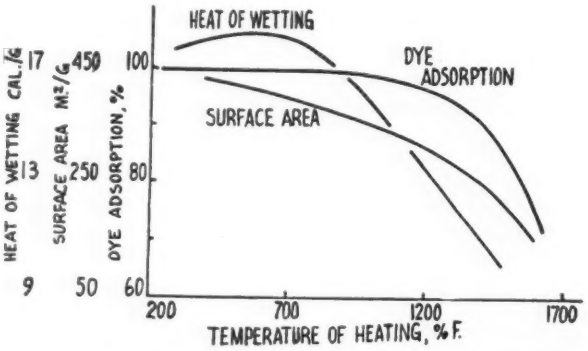

Fig. 2. Influence of Heat on Dye Adsorption, Surface Area, and Heat of Wetting of Silica-Type Pigments. Note 800° F. Optimum

The bottom curve denotes the surface area of silica gels *vs.* the temperature of heating. The surface area was determined by Milligan and Rachford,[7] using the method of Harkins and Jura. The former obtained a similar curve using the method of Brunauer, Emmet, and Teller.

When the heated silicas were compounded into a *Hevea* stock at 50 parts loading, the tensile and elongation values obtained resulted in curves having the same shape as those in Figure 2 (Figure 3). The modulus values increased sharply when the silica was heated slightly above 212° F. Heating at higher temperatures caused no decrease in modulus in the temperature range studied.

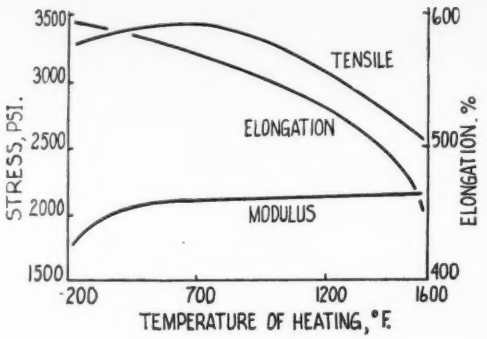

Fig. 3. Effect of Heating on Physical Properties of Compound. Note 800° F. Optimum

Figure 4 presents the heat of wetting of silica gels per unit area as the temperature of heating is increased. This curve is based on figures calculated from the heat of wetting per unit weight and the surface area per unit weight given in Figure 2. The heat of wetting per unit area increases on heating although both the total heat of wetting and the total surface area decrease on heating because the percentage decrease in heat of wetting is much smaller than the percentage decrease in the surface area. This higher heat of wetting per unit area may be partially responsible for the modulus increase. For purposes of comparison, the 400% modulus curve from Figure 3 is repeated in Figure 4.

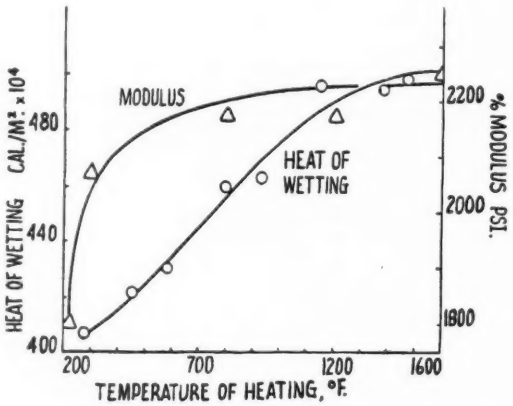

Fig. 4. Effect of Temperature of Heating on Heat of Wetting per Unit Area of Silica-Type Pigments Again Shows Evidence of 800° F. Optimum

The curves in Figures 2, 3, and 4 show that the optimum temperature for heating a colloidal precipitated silica to get the maximum reinforcement is about 800° F. Above that temperature fusion of the gel particles must start to take place to reduce the tensile and elongation although the modulus is still unaffected.

Electron micrographs taken in our laboratory indicate that precipitate of silica pigments heated to 1200° F. were unfused; while electron micrographs of the same pigment heated to 2150° F. show appreciable fusion (Figure 5). The same silica heated to 1600° F. showed partial fusion.

Shapiro and Kolthoff,[8] working with a silica gel rather than the precipitated pigment-type silica, have shown that heating below about 1300° F. causes a "perfection process" to take place, resulting in smaller surface area without reducing the porosity. Higher temperatures cause

[6] *J. Phys. Chem.*, 36, 475 (1932).
[7] *J. Phys. & Colloid Chem.*, 51, 33 (1947).
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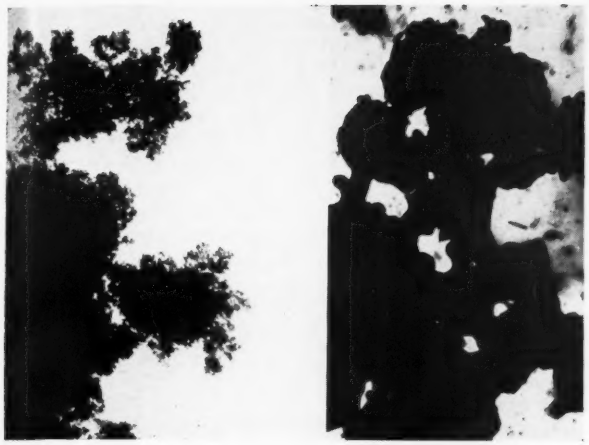

Fig. 5. Heating of Colloidal Silica at 1200° F. (*Left*) Does Not Fuse Pigment; at 2150° F. (*Right*) Fusion Is Evident (Electron Micrographs Show Silica as Black Areas)

reduced porosity and also a still further decrease in surface area.

Investigators dealing with other pigments have found the same effects on heating pigments. Barnett and Jones,[9] working with zinc carbonate and several other inorganic pigments in GR-S, found that maximum reinforcement occurred on heating at 300-400° C. (572-750° F.) for one hour. Tensile values increased from 815 to 2060 psi. Heating at 1382° F. for one hour reduced the tensile to 1370 psi.

McCarter and his co-workers showed that by heating clays above 1300° F. the surface area decreased to one sixth of the unheated value.[10]

Addition of Glycols

Previous publications have demonstrated advantages of adding ethylene or diethylene glycol to rubber compounds using silica type pigments.[11, 12, 13] Dye adsorption studies made with malachite green showed that addition of glycols or amines was effective in retarding adsorption (Table 3).

TABLE 3. EFFECT OF VARIOUS SURFACE TREATMENTS ON MALACHITE GREEN DYE ADSORPTION

Sample	Dye Adsorbed, %	
	Aqueous Solution	Chloroform Solution
1. Control—precipitated silica	99.6	99.9+
2. Silica +1% octadecylamine	66.0	
3. Silica +6% ethylene glycol		79.0
4. Silica heated to 1200° F.		93.4
5. Silica heated to 1200° F. +12% diethylene glycol		59.0

A compounding study was made with various glycols to determine what effect the glycol structure might have upon the properties of the rubber stocks. The following formula was used for all of these stocks. Variations in the glycol are listed in Table 4.

COMPOUND FOR GLYCOL STRUCTURE STUDY

Hevea	100
Sulfur	2.5
Zinc oxide	5
Stearic acid	3
Pine tar	2
Antioxidant	1
Accelerator (sulfenamide type)	2
Silica	50
Glycol or Softener	3
	168.5

The stocks in Table 4 are arranged according to increasing modulus at 400% elongation. For the most part tensile values are also in increasing order. The optimum cure for all of the stocks was 40 minutes at 280° F. There was no appreciable difference in the rate of cure due to differences in the glycol structure.

TABLE 4. THE EFFECT OF VARIOUS GLYCOL-TYPE MATERIALS ON SILICA REINFORCEMENT*

Glycol	Modulus, 400%, PSI.†	Tensile, at Break, PSI.	Elongation, %
Resorcinol	1200	2075	560
Control—none	1325	2625	580
Octyl alcohol	1450	2775	560
Ethylene glycol	1600	3000	570
Propylene glycol	1625	2925	570
Thiodiglycol	1675	3150	570
Diethylene glycol	1700	3225	570
Polypropylene glycol (1200 mol. wt.)	1725	3000	580
Glycerin	1725	3075	550
Diethylene glycol monoethyl ether	1725	3250	540
Pinacol	1750	3150	580
Polyethylene glycol (200 mol. wt.)	1875	3250	550
Heptanediol—2,4	1975	3300	550
Dipropylene glycol	2275	3275	480

*Three parts of glycol and 50 parts of silica used/100 parts of rubber.
†Optimum cures 40 min. @ 280° F.

It is interesting that the aromatic dihydroxy compound (resorcinol) is poorer than the control; while all of the aliphatic compounds, even octyl alcohol, are better than the control. The tested compounds fall into three general classes (Figure 6).

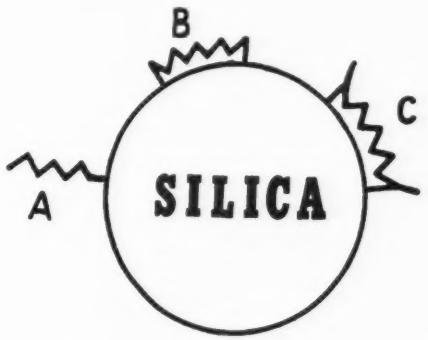

Fig. 6. Schematic Diagram of Effect of Class A Compounds (Alcohols and Glycol Ethers), Class B (Dihydroxy Compounds with No Pendant Alkyl Groups), and Class C (Dihydroxy Compounds with Pendant Alkyl Groups) on Silica-Type Pigments

Class A is the monohydroxy compounds (alcohols or glycol ethers). They have only one functional group with which to attach themselves to the silica particle and hence cover little of the surface, but they can promote adhesion by extension of the long hydrocarbon chain into the rubber matrix.

Class B includes the dihydroxy compounds with no pendant alkyl groups (ethylene glycol, diethylene glycol). They can cover more of the silica particle; but if both end groups are attached, there is little protrusion into the rubber.

Class C embraces those dihydroxy groups having pendant alkyl groups beyond the hydroxyl groups (dipropylene glycol, pinacol). These seem to impart the most reinforcement to the rubber stocks. The hydroxyl groups on pinacol are on adjacent carbon atoms and are probably too close together. The carbon atoms bearing the hydroxyl groups in dipropylene glycol are separated by three atoms, which permits greater freedom in finding sites for attachment.

[9] *Rubber Chem. Tech.*, 23, 229 (1950).
[10] W. S. W. McCarter, K. A. Krieger, H. Heinemann, *Ind. Eng. Chem.*, 42, 529 (1950).
[11] E. M. Allen, F. W. Gage, R. F. Wolf, India RUBBER WORLD, 121, 577 (1949) and 121, 669 (1950).
[12] Pigment Data Bulletins 50-10 (1950) and 51-3 (1951), Columbia Chemical Division, Pittsburgh Plate Glass Co., Pittsburgh, Pa.
[13] Columbia Pigments Data Sheet No. 47-2, Columbia Chemical Division, Pittsburgh Plate Glass Co. (1947).

Combination Treatments

Since both heat treatment of silica and the addition of glycols imparted greater reinforcement to silica loaded stocks, studies were made combining the two treatments. The effect of combining the treatments is shown in Table 5. The particular heat treatment used on the silica in stock 2 was made before the optimum heating temperature had been determined, hence the low tensile, but it serves to illustrate the general relationship. In this case higher modulus was obtained using the same accelerator loading as the control. In stock 3 addition of diethylene glycol to the silica results in slightly higher modulus and equal tensiles, while less accelerator was used. In stock 4, in which the treatments were combined, a much higher modulus was obtained at the reduced accelerator loading.

TABLE 5. EFFECT OF COMBINING HEAT TREATMENT AND GLYCOL ADDITION—NATURAL RUBBER STOCKS

	1	2	3	4
Heat treatment	....	5 hrs. @ 1600° F.	....	5 hrs. @ 1600° F.
Diethylene glycol, pts.	....	....	3	3
Accelerator, pts.	2	2	1.25	1.25
Cure—Min. @ 280° F.				
Modulus, PSI.—400%				
10	NC	NC	1550	2525
20	NC	NC	2000	2550
40	1925	2825	1825	....
80	1650	2450	1600	2275
Tensile @ Break, PSI.				
10	NC	NC	3400	2600
20	NC	NC	3400	2550
40	3450	2825	3250	2450
80	3250	2450	3275	2275
Elongation @ Break, %				
10	NC	NC	620	410
20	NC	NC	550	400
40	590	400	570	380
80	610	400	600	400

NC—No cure.

A similar comparison was made in 41° F. GR-S, using only one part of accelerator (Table 6). In this series there was no appreciable cure until both treatments were combined in the same stock.

TABLE 6. EFFECT OF COMBINING TREATMENTS IN LTP—GR-S

	1	2	3	4
Heat treatment	....	1½ hrs. @ 1200° F.	....	1½ hrs. @ 1200° F.
Diethylene glycol, pts.	....	....	3	3
Accelerator, pts.	1	1	1	1
Cure, Min. @ 280° F.				
Modulus, PSI.—400%				
10	NC	NC	NC	NC
20	NC	NC	NC	1300
40	NC	NC	NC	1900
80	NC	NC	1175	2000
Tensile @ Break, PSI.				
10	NC	NC	NC	NC
20	NC	NC	NC	2900
40	NC	NC	NC	2800
80	NC	NC	2475	2675
Elongation @ Break, %				
10	NC	NC	NC	NC
20	NC	NC	NC	720
40	NC	NC	NC	510
80	NC	NC	660	490

NC—No cure.

The results of several variables in silica treatment combined with various accelerator loadings are reported in Table 7. By a combination of heat treatments and the addition of glycols, ethanolamine, or octadecylamine, the accelerator loading can be reduced, with a resultant improvement in properties of the rubber stocks.

In summary, it has been discovered that the surface of silica-type pigments can be modified by a heat treatment or by the addition of glycols or amines. Such treatments result in better tensile reinforcement at lower accelerator levels.

Acknowledgment

The author gratefully acknowledges the permission of the Firestone Tire & Rubber Co. to publish the results of this investigation.

Preparing Alkylated Compounds

A SERIES of procedures has been developed for altering the molecular structure of such varied organic substances as phenols, mercaptans, alcohols, amines, salts, and benzene through the introduction of the long-chain alkyl group, *n*-octadecyl *p*-toluenesulfonate. Working under a research contract from the Southern Utilization Research Branch, United States Department of Agriculture, as part of an oilseeds program, a group of chemists headed by David A. Shirley discovered the methods at Tulane University, New Orleans, La.

Although the alkylated compounds were not produced in quantity, the methods are believed to be applicable to the preparation of such materials as additives, plasticizers, and surface-active agents. The alkylating agent, derivable from commercial vegetable oils, has been used successfully in modifying thiophenol; *p*-nitrothiophenol; *o*- and *p*-thiocresol; *n*-butyl, decyl, dodecyl, and octadecyl mercaptans; 1,2-ethanedithiol; ethylene glycol (to form *n*-octadecyl and di-*n*-octadecyl ethers); 2-octanol; 1-butanol; 1-octanol; 1-octadeconal; benzyl alcohol; beta-hydroxyethyl mercaptan; aniline; *m*-chloroaniline; *n*-butylamine; *p*-toluidine; *p*-nitroaniline; beta-naphthylamine; and diphenylamine.

Publications describing the work, all under the main title, "Alkylation with Long-Chain *p*-Toluenesulfonates," are: "II. Reaction of *n*-Octadecyl *p*-Toluenesulfonate with Mercaptans and Thiophenols";[1] "IV. Alkylation of Alcohols and Amines with *n*-Octadecyl *p*-Toluenesulfonate";[2] "V. Anionic Displacement Reactions of *n*-Octadecyl *p*-Toluene Sulfonate";[3] and "VI. Friedel-Crafts Reaction of *n*-Octadecyl *p*-Toluene Sulfonate and Benzene."[4]

[1] *J. Am. Chem. Soc.*, 73, 4885 (1951).
[2] *J. Org. Chem.*, 18, 4, 378 (1953).
[3] *Ibid.*, 18, 1591 (1953).
[4] *J. Amer. Chem. Soc.*, 75, 6333 (1953).

TABLE 7. EFFECTS OF SEVERAL VARIABLES ON SILICA LOADED *HEVEA* STOCKS

Stock No.	1	2	3	4	5	6	7	8
Heat treatment	....	5 hrs., 1600° F.	....	5 hrs., 1600° F.	....	5 hrs., 1600° F.	....	....
Dipropylene glycol	....	....	3	3	3	3	....	2.5
Triethanolamine					1	1	....	....
Octadecylamine							0.5	0.5
Accelerator*	2.0	1.75	1.75	1.0	1.5	1.0	2.0	1.25
Cured 40 Min. @ 280° F.								
400% Modulus, psi.	1850	2550	1975	2175	2000	1975	2350	1850
Tensile, psi.	3375	2950	3200	2975	3050	2800	3300	3300
Elongation, %	580	460	530	500	510	490	510	550
Tensile after 2 days @ 212° F., psi.	2800	2150	2600	2175	2850	2450	2750	2625
Shore (A) hardness	50	63	60	59	59	60	53	54
Rebound, % 72° F.	69	71	61	65	67	68	72	71
212° F.	82	87	80	87	81	86	86	85
Blowout time, min.†	29	66	41	41	16	62	69	68

*Adjusted so as to give optimum cures at 40 min. @ 280° F.
†Load 550 lb., 0.4 throw, 0.3 signal (Firestone flexometer).

Marking Paints for Rubber Bales[1]

K. F. Heinisch[2] and R. M. Wargadiwidjaja[2]

AN IMPROVED bale marking paint for crude natural rubber, which retains its legibility under simulated service conditions during shipment, has been developed.

These new marking paints are based on dyes soluble in organic solvents and have the additional advantage of fluorescence which permits identification with ultra-violet light, even though the marking is masked by bale coating solution or other materials.

THE marking paints for natural rubber bales which have been in general use up to the present time have contained, in general, pigment as coloring matter. Only in certain areas are water soluble dyestuffs (e.g., Bowman's water soluble stencil ink) still in use.

In an earlier publication[3] some specifications for rubber marking paints based on practical experience were given. Observations from the commercial use of pigment-type paints have shown, however, that the majority of these paints do not have good adherence to the rubber, with the result that when the bale arrives at its destination, the markings are very difficult to identify, thereby causing a great deal of trouble from improper deliveries for producers, shippers, and consumers.

One of the requirements for good adhesion of bale marking paints is a good, firmly adhering bale coating compound. Both the INIRO and The Rubber Manufacturers Association, Inc., bale coating solutions satisfy this requirement, but the glue-talc coating solution sometimes used in Malaya provides a poor background for bale marking.[4] The tapioca-talc solution,[5] which was advocated at the end of World War II, is also not satisfactory. The use of the glue-talc and the tapioca-talc solutions has not been permitted since December 1, 1953.[6]

Another important requirement for a good bale marking paint is that it penetrate, at least partially, into the bale coating and rubber itself. Pigments do not penetrate, but an improvement can be achieved by the addition of a small amount of low-viscosity oil (e.g., SAE 20) and the use of a binary mixture, such as mineral turpentine plus xylene or toluene, as solvent. A marking paint of this type was given in INIRO Communication No. 86,[3] and although it is not an ideal paint, good results have been obtained in practice. It appeared desirable, however, to develop a paint which would penetrate through the bale coating into the wrapper sheet and which could not be easily effaced.

Penetrating Paints for Bale Marking

Considerable improvement in penetration and permanence of marking paints for bale marking can be achieved by the use of dyestuffs soluble in organic solvents instead of the previously used pigments. In addition, it is possible to affect and to a certain extent control the penetrating capacity and the brightness of the paint by using two different types of dyestuffs, viz., basic- and azo-dyestuffs, alone or as admixtures.

Two types of dyes were used in preparing the INIRO paints:

TYPE A. Azo-dyes are insoluble in water, soluble in oils, fats, waxes, and organic solvents. These dyes are soluble in solid rubber and therefore provide good penetration. The hue is not bright, and the bale marking is only slightly colored, if at all.

TYPE B. The basic dyes are free bases of the induline and nigrosine types. They are generally not soluble except in fatty acids, but the fatty acid mixture imparts color to organic solvents, fats, oils, etc. The colors are bright, and the dyes penetrate into the bale coating although penetration into the rubber is slight.

By combining dyes of type A with those of type B, the properties of both may be incorporated into the marking paint. It is also possible to prepare slightly penetrating and strongly penetrating paints, according to the formulae and instructions given below:

MARKING PAINT NO. 1—SLIGHTLY PENETRATING

Type B dye is well wetted out with oleic acid in the proportions of 1:2 and heated on a water bath to 60° C., with stirring. This mixture is subsequently diluted with approximately 450 milliliters of benzene to complete dissolution and is further heated to 60° C. The dye solution is then added to one of the two base mixtures, outlined below. Since some dyes are sensitive to heat, the temperature should not rise above 60° C. during mixing.

MARKING PAINT NO. 2—STRONGLY PENETRATING

A mixture of type A and type B dyes in the ratio of 1:5, or a maximum of 1:3, is used. The type B dye is heated first with oleic acid in the proportion of 1:2, as described above. After the mixture has been diluted with benzene, type A dye is added, and heating continued at about 60° C. until the dyes are completely dissolved. The dye mixture is then added to one of the base formulas.

The complete formulation and mixing instructions including Base Formula *a* and Base Formula *b* are described in detail. Base Formula *a* is made with masticated rubber, that is, crepe rubber broken down on the mill with RPA #2.[7] Base Formula *b* is made with unmasticated crepe to which S Polymer 60[8] has been added to improve the adhesive properties of the paint and increase the penetration. The damar resin is used to aid the drying of the paint.

FORMULA AND MIXING INSTRUCTIONS USING BASE FORMULA *a*

A 2,000-ml. rubber solution (mineral turpentine) contains 80 gms. of crepe rubber broken down with 0.3% RPA No. 2, and 50 gms. of damar resin and is called Base Formula *a*. The dye or dyes (25-50 gms.) dissolved in oleic acid (50-100 ml.) and benzene (400-450 ml.) are then added. The dye mixture is added to the Base Formula, and volume is made up with benzene to 2.5 liters.

[1] Information No. 231, Indonesian Rubber Research Institute, Bogar, Indonesia.
[2] INIRO, Bogar, Indonesia.
[3] K. F. Heinisch, *Arch. Rubbercult.*, 29, 65 (1952); INIRO Communication No. 86.
[4] J. C. Roberts, India RUBBER WORLD, 121, 678 (1950).
[5] RRIM Circular No. 24 (1947), Rubber Research Institute of Malaya, Kuala Lumpur, Malaya.
[6] RMA Type Descriptions and Packing Specifications for Natural Rubber, Amendment 1, Sept. 1, 1953, The Rubber Manufacturers Association, Inc., New York, N. Y.
[7] 33⅓% Naphthyl beta mercaptan and 66⅔% inert hydrocarbon. E. I. du Pont de Nemours & Co., Inc., rubber chemicals division, Wilmington, Del.
[8] Now Parapol S. Available in development quantities from Enjay Co., market development division, Elizabeth, N. J.

Formula and Mixing Instructions Using Base Formula *b*

A 1,000-ml. rubber solution (mineral turpentine) contains 25 gms. of unmasticated crepe rubber and 50 gms. of damar resin and is further compounded with 1,000 ml. of a 5-10% solution of S Polymer 60 in mineral turpentine. This mixture is Base Formula *b*. The dyes (25-50 gms.) are dissolved in oleic acid (50-100 ml.), and benzene (400-450 ml.) is then added. The dye mixture is added to the Base Formula, and volume is made up with benzene to 2.5 liters.

In the preparing of the base formulae the rubber and damar resin are dissolved in mineral turpentine, using heat and stirring, if necessary. When a paint is prepared using Base Formula *b*, then S Polymer 60 is also added. In the preparing of the marking paint, the dye solution is then mixed with the rubber solution. When a slightly penetrating paint is desired, the final mixture contains only type B dyes (Marking Paint No. 1); highly penetrating paints contain a mixture of type A and type B dyes (Marking Paint No. 2).

These marking paints have good flowing properties, but can be thickened, if necesary, by adding up to 10% stearic acid on the total volume of the paint. If a spray paint is required, the mixture is diluted with mineral turpentine in the proportion of 1:3.

Table 1, fourth column, shows total dye concentration in the paint required to produce a bright color.

Table 1. Color, Type, and Concentration of Dyes† Used

Color	Type	Name	Concentration in Paint %
Bright red	B	Rhodamine BS 1:1 Yellow OS	0.5-1.0
	A	Red OS	
Purple-red	B	Rhodamine BS	0.5-1.0
	A	Red OS	
Yellow	B	Orange YS 1:8 Yellow OS	1-2
	A	Yellow ADS	
Blue	B	Victoria Blue RM	1-2
	A	Blue CBS	
Black	B	Nigrosine NS	2-0
Green	B	Base de vert Malechite J3E*	1-0

*Pale.

† The "Waxoline" brand of dyes made by Imperial Chemical Industries, London, England, was used.

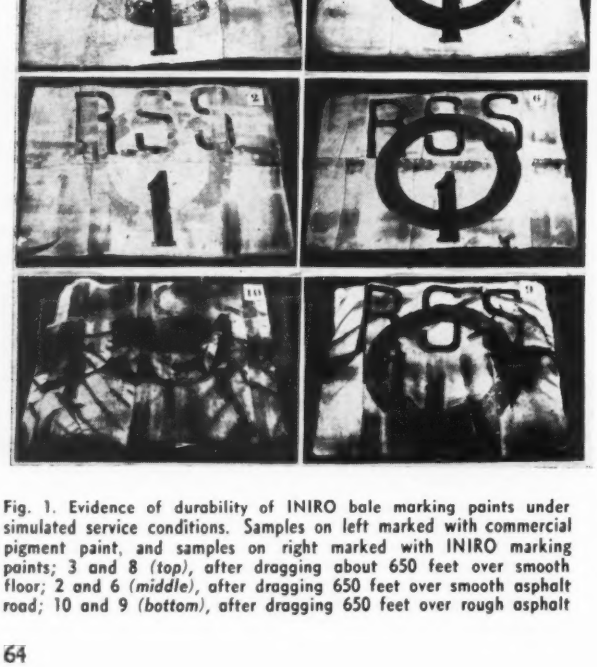

Fig. 1. Evidence of durability of INIRO bale marking paints under simulated service conditions. Samples on left marked with commercial pigment paint, and samples on right marked with INIRO marking paints; 3 and 8 *(top)*, after dragging about 650 feet over smooth floor; 2 and 6 *(middle)*, after dragging 650 feet over smooth asphalt road; 10 and 9 *(bottom)*, after dragging 650 feet over rough asphalt

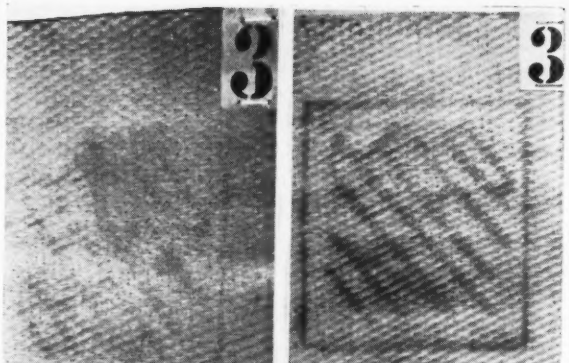

Fig. 2. INIRO paint practically obliterated by bale coating solution on left, as viewed in daylight, may be seen under ultra-violet light

Because a bright red color is desirable for shipping marks, it is advisable to mix Rhodamine BS with Yellow OS. Rhodamine BS alone gives a purple-red color. To make the highly penetrating paint No. 2, Red OS is added in the ratio of 1:5 to the 1:1 mixture of Rhodamine BS and Yellow OS. Similarly, Yellow OS has a green cast and has to be mixed with Orange YS in the proportion of 8:1.

Wear Tests

To duplicate service conditions, bales of rubber marked with pigment-type and INIRO dye-type paints were dragged for about 650 feet along a smooth floor and also along a smooth and a rough asphalt road. The superiority of the INIRO dye-type paint is evident from the illustrations. (See Figure 1.)

In addition, regular commercial shipments of baled rubber marked with INIRO dye-type paints made to the United States and to Europe have indicated excellent durability for these paints.[10]

Identification by UV Light

The red and yellow dyes used in the marking paints exhibit fairly strong fluorescence and therefore have the additional advantage that they may be identified in ultra-violet light, even after a second bale coating has been applied, or the markings have been made completely invisible to the naked eye. Figure 2 shows the markings after a second application with bale coating solution as viewed in daylight and under ultra-violet light.

Summary and Conclusions

Pigment-type marking paints for identifying crude natural rubber bales during shipment to the consumer have never been able to withstand adequately the handling in loading and unloading on ships, railroad cars, and trucks, without often becoming illegible.

New bale marking paints based on dyes soluble in organic solvents have been developed by the Indonesian Rubber Research Institute, Bogar, Indonesia, which appear to have improved durability under simulated and actual service conditions. In addition, INIRO bale marking paints have the advantage of identification under ultra-violet light when the marking cannot be seen in daylight owing to being covered with excessive bale coating solution or other material that may obliterate the marking.

[9] K. F. Heinisch, INIRO Communication No. 99. To be presented at the Third Rubber Technology Conference, London, England, June, 1954.

[10] Private communication, American President Lines, New York, N. Y.

Editorials

CED Report, "Defense Against Recession," Merits Industry Attention

THE Committee for Economic Development, which was formed in 1942 by a group of businessmen who were confident that a postwar depression, then so freely forecast, could be avoided, released in March a report entitled, "Defense Against Recession," that merits industry attention. The report is one of a series dealing with the problem of greater economic stability in the United States now and in the future.

Background work for this report began in 1952, when CED cooperated with the U. S. Department of Commerce in a study of economic problems that might develop after the defense program reached its peak. The Commerce Department published its report in December, 1952, under the title, "Markets after the Defense Expansion."

CED made its study in 1953 through its own Research and Policy Committee, not knowing when these defenses against recession might be called into play.

It is pointed out that changes which have taken place in the federal budget and other government programs since the depression of the 1930's will help cushion declines. If the various stabilizing factors prove insufficient, however, the government should be prepared to make vigorous use of large-scale tax cuts and public works programs and business of improved policy with respect to inventories, capital investment, and sales effort.

CED emphasized that individual businesses can make a greater contribution to stability than they have in the past by developing new products to satisfy new wants, applying improved production methods to reduce costs, and by bringing more products within the reach of more people.

Fluctuations in inventories and in plant and equipment expenditures have been both the cause and the result of recessions. Businesses should plan their investment programs with more attention to long-run growth prospects and should avoid inventory speculation, holding their stocks to the minimum level needed for efficient operation.

Unstabilizing inventory practices would be greatly reduced if trade associations and government agencies would increase the flow of "more up-to-date and complete statistical information on inventories, sales and other subjects."

CED concluded that our economy can achieve its high potential without violent fluctuations. The rubber and associated industries would appear to share with the Committee the confidence in our future.

A recent report from the Commerce Department indicates that plant and equipment expansion in the rubber industry in 1954 will about equal that of 1953 at $160 million. With the tire market expected to continue at or near its present high level and the market for rubber products other than tires growing at a steady rate, the rubber industry seems likely to contribute its part to overall national economic stability. One of the industry's own major defenses against recession is the greater stability of raw material prices achieved in recent years.

Are Rubber Diplomas Desirable in the U.S.?

SHOULD and could there be established a standard level of technical competence for rubber technologists in the United States? An international rubber diploma is being considered in Western Europe, and this country might profit by joining in such an effort.

For the past several years the Institution of the Rubber Industry in England has been conducting examinations for technologists of the industry in that country and granting diplomas to those able to qualify. This procedure which has the effect of providing higher standards of technical performance, is now to be extended to many countries of Western Europe to provide an equal technical level of education on an international basis in the rubber industry. General agreement on requirements for an international rubber diploma was reached at a meeting in Paris, France, in July, 1953.

The recent increase in interest in courses in rubber technology among the members of the local rubber groups in this country is due to the desire of our technical men to improve their knowledge and abilities and has been encouraged by their employers. Also, the scope of the activities of rubber technologists has broadened greatly in recent years.

The courses in rubber technology in the United States, however, vary widely in type and character. Most of them are conducted by the local rubber groups; some of these are in collaboration with universities and colleges. But some are given only by members of the groups with guest lecturers from rubber and supplier companies. No recognition, at least on a national basis, is obtained unless the course is a part of an existing university curriculum.

We have been strong supporters of these educational efforts of the local rubber groups, but we think the time has come to consider the desirability of some degree of standardization on a national level and even participation on an international level with similar efforts abroad.

Expressions of opinion from our readers will be most welcome and may provide a means for an open forum on the subject in this column.

R. G. Seaman

DEPARTMENT OF PLASTICS TECHNOLOGY

Liquid Polymers Combined with Epoxy Resins[1]

J. S. Jorczak[2] and J. A. Belisle[3]

THE coreaction of epoxy resins with polysulfide liquid polymers, both of which are low-viscosity polymeric products which can be cured or converted in place, results in products having many properties better than those of either polymer alone.

New data on improved impact resistance, water absorption, and vapor transmission of epoxy-polysulfide cured mixtures are detailed.

Polysulfide liquid polymers added to epoxy resins give castings with greater flexibility, adhesives with better wetting properties, and laminates with improved impact strength and reduced shrinkage. Polysulfide-epoxy resin paints with good solvent and chemical resistance are being developed.

THIS paper deals with the modified properties which can be obtained from the reaction products of liquid poly-epoxide resins and polythiol polysulfide polymers. Epoxy resins are now supplied commercially by a number of companies in the United States, and there are reports that other chemical manufacturers will enter the field in the not too-distant future.

Epoxy resins have a number of attributes, among which are fast-setting and low shrinkage properties. As a new member of the plastics family, the resins have stirred interest in many fields in defense and industry. Much of this interest stems from the application possibilities inherent in the use of reactive low-viscosity polymeric products which can be cured or converted in place, as desired.

From the nature of their physical properties, it is believed that amine-converted liquid epoxy resins have a moderately cross-linked lattice structure. Although the converted resins have fairly good impact resistance, a much higher degree of flexibility and impact resistance is necessary for many applications. Several methods of developing flexibility have been tried: (1) building a flexible structure within the epoxy resin itself; (2) using compatible plasticizers; and (3) using coreactive flexibilizing resins.

Products of the first type are still in the experimental stage, but indicate that flexibility is obtained at a sacrifice in other properties. Products of the second type give good initial results, but the plasticizer leaches out under service conditions so that the imparted flexibility cannot be considered permanent. In the third class, the final product results from the interaction of a poly-epoxide and a polyamide or a polythiol. Although the polyamides do coreact with epoxy resins and can be considered permanent flexibilizers, they are quite viscous and limited in compatibility with commercial epoxy resins.

Polythiol polysulfides appear to have many desirable properties which make them useful in flexibilizing epoxy resins. Among the advantages to be gained from use of the polysulfides are permanent flexibility, high impact resistance, good aging, and the oil, water, and chemical resistance inherent in the saturated polysulfide elastomeric chain.

Properties of Polysulfide-Epoxides

The first effect observed with the incorporation of Thiokol LP-3 liquid polysulfide polymer in epoxy resins is a lowering of the viscosity of the resin. This action results from dilution of the viscous resin by the less viscous LP-3.

Other properties of polysulfide-epoxide combinations are given below. It should be noted that the data reported are typical of epoxide-LP-3 cures and are indicative of the trends observed with all commercial epoxides tested to date. The values reported, however, apply only to the specific combinations described. Unless otherwise specified, the catalyst content was 10 parts by weight of amine to 100 parts by weight of epoxy resin. Of the catalysts, TET is triethylene tetramine, and DMP-30[4] is technical grade tri-dimethylaminomethyl phenol.

Strength Properties

Tensile strength, elongation, and hardness properties of cured mixes of LP-3 and BRR-18794[5] resin are given in Table 1. Tests were made on three polysulfide-epoxide ratios, using TET and DMP-30 as catalysts.

It can be seen that increasing the concentration of LP-3

[1] Based on a paper presented at the National Technical Conference, Society of Plastics Engineers, Inc., Toronto, Ont., Canada, Jan. 28, 1954.
[2] Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.
[3] Formerly with Thiokol, now with Grumman Aircraft Engineering Corp., Bethpage, N. Y.
[4] Product of Rohm & Haas Co., Philadelphia, Pa.
[5] Product of Bakelite Co., New York, N. Y.

results in lowering the tensile strength and hardness of the cured material while increasing its ultimate elongation.

TABLE 1. TENSILE STRENGTH, ELONGATION, AND HARDNESS OF LP-3/BRR-18794 MIXES

	TET Catalyst			DMP-30 Catalyst		
Ratio of LP-3/BRR-18794	1:2	1:1	2:1	1:2	1:1	2:1
Tensile strength, psi.	2,950	950	125	5,375	975	475
Elongation, %	20	40	50	0	30	150
Hardness, Shore D	53	39	14	60	48	23

Proof of the fact that the polysulfide is chemically bound in the cured material is found in the extraction data given in Table 2. Toluene is an excellent solvent for uncured LP-3; so it was used as the extraction medium. The results given are for 24-hour Soxhlet extraction in boiling toluene, following the procedure of ASTM D297-43T. The epoxy resin used in the mix was Epon 828.[6]

TABLE 2. EXTRACTION OF LP-3 FROM EPOXIDE MIX BY BOILING TOLUENE

	TET Catalyst			DMP-30 Catalyst		
Ratio of LP-3/Epon 828	1:2	1:1	2:1	1:2	1:1	2:1
LP-3 extracted, %	4.5	4.3	6.7	0.4	1.0	0.9

Heat Aging

Accelerated aging of polysulfide-epoxide products by heating at 212° F. for 70 hours has resulted in conflicting data which can be explained by considering the chemical reactions involved. Table 3 reveals that heat aging mixtures catalyzed with TET show retention of properties; while material catalyzed with DMP-30 softens, loses tensile strength, and, except for the product having a 2:1 LP-3/BRR-18794 ratio, gains in elongation.

TABLE 3. EFFECT OF ACCELERATED HEAT AGING (70 HOURS AT 212° F.)

	TET Catalyst			DMP-30 Catalyst		
Ratio of LP-3/BRR-18794	1:2	1:1	2:1	1:2	1:1	2:1
Tensile strength, psi.:						
Original	2,950	950	125	5,375	975	475
Aged	4,475	1,425	75	3,450	650	75
Elongation, %:						
Original	20	40	50	0	30	150
Aged	0	30	40	20	50	30
Hardness, Shore D:						
Original	53	39	14	60	48	23
Aged	48	43	13	57	25	13

Triethylene tetramine is a straight-chain compound, any of whose amino groups can react to form a nucleophile (atom rich in electrons) which can further react to form a covalent bond with any unreacted epoxy group. This covalent bond is thermally stable. On the other hand, tri-dimethylaminomethyl phenol (DMP-30) has no available hydrogen on the amino nitrogens and, therefore, cannot form a covalent bond. The amino nitrogen, however, has an unshared pair of electrons which it can donate to an electrophile (atom low in electrons) and react to form a coordinate covalent bond that is thermally unstable and is broken on heating. At the end of the test, as the material cools, these coordinate covalent bonds may or may not reform. Because of the length and the relatively low mobility of the polymerized chains, the probability that all the broken bonds will reform upon cooling is very small.

This would explain why originally higher tensile strengths and hardness values are obtained with DMP-30 catalyzed cures than with TET cures. This phenomenon also limits the use of poly-tertiary amines as catalysts to applications where temperatures do not exceed about 140° F.

Impact Resistance

One of the most outstanding improvements imparted to epoxy resins by the incorporation of LP-3 is increased impact resistance. Most commercial epoxy resins cure to glass-like materials in which strains develop upon cooling. Elastomeric segments interspersed along the chains of cured epoxy molecules relieve these strains, giving the material high impact resistance.

Data on impact resistance are shown in Table 4. The test procedure and apparatus were in accordance with Navy Specification MIL-C-16923 (Bureau of Ships). The highest impact value shown, 78.2 foot-pounds, is the maximum obtainable with our apparatus.

TABLE 4. IMPACT RESISTANCE OF L-P3/EPOXIDE MIXES

	TET as Catalyst				DMP-30 as Catalyst			
LP-3/Epoxide Ratio	0:1	1:2	1:1	2:1	0:1	1:2	1:1	2:1
With Araldite CN-503* Resin:								
Impact withstood, ft.-lbs.	1.3	78.2	78.2	78.2	—	0.6	78.2	78.2
At failure, ft.-lbs.	2.2	—	—	—	0.4	0.8	—	—
With Araldite KD-133* Resin:								
Impact withstood, ft.-lbs.	2.6	23.9	78.2	78.2	—	—	8.0	78.2
At failure, ft.-lbs.	2.8	26.9	—	—	0.4	0.4	11.9	—
With BRR-18794 Resin:								
Impact withstood, ft.-lbs.	2.9	63.5	78.2	78.2	0.4	2.3	75.3	78.2
At failure, ft.-lbs.	3.7	71.3	—	—	1.0	2.7	78.2	—
With Epon 828 Resin:								
Impact withstood, ft.-lbs.	1.0	43.0	78.2	78.2	0.48	0.9	56.5	78.2
At failure, ft.-lbs.	1.5	51.8	—	—	0.50	1.4	65.9	—

*Product of Ciba Co., Inc., New York.

Tests under way at the present time indicate that LP-3 improves the low-temperature impact resistance, low-temperature flexibility, and thermal shock resistance of epoxy resins.

Moisture Properties

Tests conducted at our laboratories indicate that the incorporation of LP-3 in epoxy resin lowers the moisture vapor transmission and increases the water absorption of the cured material. Table 5 gives moisture vapor transmission data, obtained in accordance with ASTM D814-46T, for mixtures of LP-3 with three commercial epoxy resins. Figure 1 shows water absorption values obtained with mixes of LP-3 and BRR-18794 and Epon 828, using both TET and DMP-30 as catalysts.

TABLE 5. MOISTURE VAPOR TRANSMISSION DATA

(Values are in fluid ounces per square foot of area after 24 hours)

	DMP-30 as Catalyst			
LP-3/Epoxide Ratio	0:1	1:2	1:1	2:1
With Araldite CN-503	0.136	0.045	0.009	0.008
BRR-18794	0.162	0.037	0.004	0.003
Epon 828	0.057	0.057	0.008	0.003

The results are not unexpected since LP-3 molecules are less polar than epoxy resin molecules. The most generally accepted theory on the mechanism of moisture vapor transmission is that water molecules move from one polar group to another. Water molecules, therefore, should move quite readily in a mass of tightly knit, highly polar molecules, as is found in cured epoxy resin. When amorphous, less polar molecules are introduced, the structure is loosened, and moisture vapor transmission decreased. On immersion in water, this looser structure permits the absorption of a larger amount of water molecules into the interstices of the lattice structure.

Applications

The earliest large-scale application of epoxy resins was developed by reacting the resins with low-cost drying oils and using the product in high-quality alkyd-type paints. Until a few years ago liquid epoxy resins were not available in quantity and were not considered practical or sufficiently uniform in quality for use in production work. During the past two years liquid epoxy resins have been finding increasing use in casting and embedment applications, adhesives, laminates, and protective coatings.

[6] Product of Shell Chemical Co., New York.

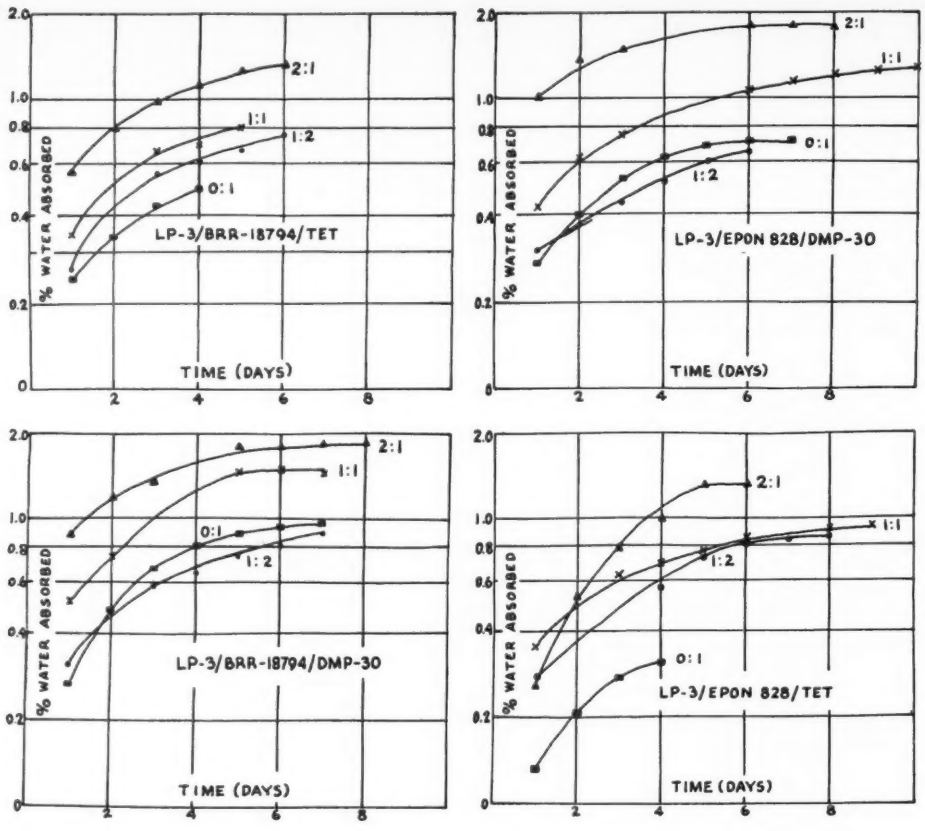

Fig. 1. Water Absorption Curves for Various Combinations of Thiokol LP-3 Polysulfide, Epoxy Resin, and Catalyst. Ratio of LP-3 to Epoxy Resin Is Shown for Each Curve

Casting and Embedment

In casting and embedment work the epoxies have good electrical properties and can withstand service over a wide temperature range. In some instances the resins can be used without modification, but in many applications the casting will crack because of high internal stress, or delicate components of the embedded assembly will break because of the shrinkage pressure resulting from conversion of the resin.

TABLE 6. TYPICAL CASTING FORMULATIONS AND THEIR PROPERTIES

Formulation (parts by weight):			
Epoxy resin	*60	†50	‡60
Thiokol LP-33§	40	50	40
TET catalyst	6	5	6
Initial properties:			
Approx. pot life, min.	30	30	30
Viscosity at 77° F., poises	19	20	19
Gel time, hrs.	1	1	1
Cure time (tack-free), hrs.	3–4	3–4	3–4
Cured properties:			
After 24 hrs. at 80° F.:			
Tensile strength, psi.	1,700	1,100	400
Elongation, %	40	40	100
Hardness, Shore D	48	39	25
After 24 hrs. at 80° F. and 70 hrs. at 212° F.:			
Tensile strength, psi.	1,900	1,700	900
Elongation, %	30	30	60
Hardness, Shore D	50	43	39
After 24 hrs. at 80° F. and 2 months at 212° F.:			
Tensile strength, psi.	1,900	2,200	1,600
Elongation, %	30	30	40
Hardness, Shore D	50	50	50
24-Hr. extraction in Soxhlet by boiling toluene, %	4	7	9
Time to reach constant weight at 212° F., days	3	7	22
Weight loss, %	1	1	7

*Epon 828.
†BRR-18794.
‡Araldite KD-133.
§Thiokol LP-33 has 0.5% trichloropropane cross-linking as compared with 2% for LP-3.

To correct these conditions polysulfide liquid polymers can be added to the formulation. The degree of flexibility imparted can be controlled by varying the concentration of liquid polymer to be used. Typical polysulfide-epoxide casting formulations and properties are in Table 6.

In most jobs it is desirable to copolymerize the resin and elastomer at ambient or moderately elevated temperatures. Liquid amines are used as catalysts to control the conversion. If the amine is soluble in the polysulfide liquid polymer, it can be masterbatched, and the resulting solution then added to the epoxy resin. Mixing and control of critical amine concentration can be facilitated by this masterbatching method.

Adhesives

Liquid epoxy resins have been used as quick-setting adhesive compounds because their basic structure contributes to the development of adhesion to almost any clean surface. Compounding improves the wetting properties of the resins, and application at 100% solids content permits quick and permanent bonding of impermeable building materials such as glass, ceramics, metals, etc.

Improved bond strengths can be obtained by careful attention to surface cleaning. In the case of metals, chromic acid etching is desirable for surface pretreatment. Rubber surfaces must be cyclized with sulfuric acid, or the epoxy resin will not adhere. The main disadvantage of the resins is their poor peel adhesion and thermal softening accompanied by creep at temperatures above 160° F.

Use of polysulfide liquid polymers in the epoxy resin reduces internal strain in the copolymer and improves the wetting properties lacking in some of the commercial resins. The thermal softening and creep characteristics are not improved, and high concentrations of liquid poly-

mer in the mix will cause thermal softening and creep at lower temperatures than for the resin itself.

Typical adhesive formulations and their properties are shown in Table 7.

TABLE 7. TYPICAL POLYSULFIDE-EPOXY ADHESIVE FORMULATIONS

Composition (parts by weight)	Formulation No. 1	Formulation No. 2
Thiokol LP-3	100	100
Epon 828	100	100
Araldite CN-503	—	25
Araldite CN-504*	100	—
Burgess Pigment No. 20†	150	112.5
DMP-30	15	10
Shear strengths, psi.:		
Aluminum-to-aluminum bonds:		
Room temp. cure for 24 hrs.	2,270	1,700
72 hrs.	2,880	2,880
24 hrs. plus one hr. at 158° F.	3,210	2,600
230° F.	4,200	—
Aluminum-to-wood bonds:		
Cured ½ hr. at 250° F.	‡810	†970
Aluminum-to-glass bonds:		
Cured ½ hr. at 250° F.	§250	§240
Peel bond strength, tin-to-tin bond, cured ½ hr. at 250° F., psi.	22.5	35

*Product of Ciba Co., Inc.
†Product of Burgess Pigment Co., Paterson, N. J.
‡Wood type failure.
§Glass type failure.

Laminates

Epoxy resins have been used with glass cloth and mat to make high-strength low-pressure laminates for use in forming tools and dies; oil and chemical pipe; and structural components. In such applications internal strains seem to weaken the laminate prematurely. The improved impact strength and reduced shrinkage factors imparted to the copolymer by polysulfide liquid polymer, as shown in Table 8, should make the laminates satisfactory for many applications.

TYPE 8. PROPERTIES OF POLYSULFIDE-EPOXIDE GLASS LAMINATES

Formation (parts by weight):				
LP-3	100	100	100	100
Epon 828	300	400	500	600
DMP-10*	30	40	50	60
Total resin content of laminate, %	20	29	27	24
Dielectric constant	4.2	4.0	4.0	3.9
Loss tangent (power factor)	0.016	0.014	0.014	0.012
Flexural strength, psi.†	57,000	53,000	54,000	56,000
Modulus of elasticity in flexure, psi.†	3.7×10^6	3.4×10^6	3.9×10^6	2.9×10^6

†Values appear somewhat out of line, but are reported here as observed.
*Dimethyl aminomethyl phenol, Product of Rohm & Haas Co.

The test specimens were ⅛-inch low-pressure laminates made with 12 plies of Owens-Corning 181-114 glass cloth. The laminates were prepared by painting both sides of the bottom ply of cloth with the polysulfide-epoxide mix and then painting the top surface of each successive ply of cloth. The laminated assembly was then cured for 30 minutes at 250° F.

Protective Coatings

The Thiokol laboratories are now working on polysulfide-epoxide air-drying paints at or near 100% solids contents. The objective is to develop a protective coating material suitable for one-coat application. The epoxide-liquid polysulfide copolymer coating should form a well-integrated film which, when air dried, should have properties similar to those of baked phenolic resins. The good adhesive properties of the epoxide mixture should provide good bonding to roughly prepared surfaces, and it is hoped that wire brushing to remove loose paint and scale will be adequate for surface preparation.

Although the materials are costly, one coat of the mixture can be applied to any desired thickness. Reduced cleaning and application costs should further offset the high material costs. If the experimental program is successful, the protective coatings should be useful in the chemical and marine industries. Some of the properties listed in Table 9 (solvent swell) and 10 (chemical resistance) are responsible for our interest in this development. The solvent swell tests were conducted in accordance with ASTM D471-51T Method B.

TABLE 9. SOLVENT SWELL OF POLYSULFIDE-EPOXIDES

	LP-3/Epoxide Ratio 1:2		LP-3/Epoxide Ratio 1:1	
	% Volume Swell after		% Volume Swell after	
Solvent	One Week	One Month	One Week	One Month
Benzene	2	30	38	81
Xylene	−2	0	1	2
Toluene	0	15	10	14
Acetone	24	17	8	7
Methyl ethyl ketone	28	20	28	27
Methyl isopropyl ketone	−2	−2	0	2
Carbon tetrachloride	−2	−3	−2	6
Ethyl acetate	3	21	13	17
Ponsolve*	−2	−2	1	2
SR-6†	−2	−2	0	1
SR-10†	−2	−2	0	0
Water	−2	−2	1	2

*Alcohol solvent, product of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
†Reference fuel, product of Enjay Co., Inc., New York.

TABLE 10. CHEMICAL RESISTANCE OF POLYSULFIDE-EPOXIDES AFTER ONE-MONTH IMMERSION

	LP-3/Epoxide Ratio	
Chemical	1:2	1:1
Hydrochloric acid, 10%	OK	OK
30%	Slightly blistered	Blistered
Nitric acid, 20%	Blistered	Disintegrated
60%	Disintegrated	Disintegrated
Sulfuric acid, 20%	OK	OK
60%	OK	Cracked
Sodium hydroxide, 10%	OK	OK
50%	OK	OK
Dibutyl phthalate	OK	OK
Sodium carbonate (saturated)	OK	OK
Chloride (saturated)	OK	OK
Aluminum sulfate (saturated)	OK	OK

Summary and Conclusions

The coreaction of epoxy resins with polysulfide liquid polymers results in products having many properties better than those of either polymer alone. Epoxy resins convert to a strained lattice structure. Polysulfide liquid polymers are saturated elastomeric chains which convert to soft rubbers having good aging, oil, and water resistance properties. When these two basic materials are combined, a wide range of properties can be had by selection of the concentrations of the two ingredients. Essentially, the polysulfides are used as modifiers for the epoxy resins and contribute lower shrinkage, lower strain, greater and permanent flexibility, much higher impact resistance, lower moisture vapor transmission, lower pouring viscosity, and better peel strength in adhesion.

Results on some of these properties have been shown in the tables. The most recent information centers around measurements of impact resistance, water absorption, and vapor transmission, and these properties are detailed.

Epoxy resins are comparatively new in the field of resins and plastics, but they have created an unusual amount of interest and activity. The response on the part of many industries to these resins indicates the possibilities for other reactive liquid resins.

Liquid polysulfide polymers appear to fit naturally into the epoxy application picture. Permanent flexibility, low strain, and low viscosity make liquid polymers useful in embedment and casting applications. Low strain, flexibility, and improved wetting properties conferred by polysulfide liquid polymers improve epoxy adhesives. The high impact resistance and lower shrinkage imparted by polysulfide liquid polymers should be advantageous in resin-glass fiber laminate structures. The possibilities seen in 100% solids air-drying paints are far-reaching, but this program is in initial stages of laboratory development.

The authors wish to thank members of the technical staff of the technical service and research departments of Thiokol Chemical Corp. for assistance in supplying data and advice in the preparation of this paper.

Meetings and Reports

SPE Sections Meet

Plastic Laminates and Tooling

TALKS on "Plastics Tooling for Industry" by Dale Knepp, Kish Plastics Products, Inc., and "Post Forming Laminates for Industry" by Louis M. Strottman, Formica Co., highlighted the March 17 dinner-meeting of the New York Section, Society of Plastics Engineers. Held in the Gotham Hotel, New York, N. Y., the meeting attracted about 85 members and guests.

Mr. Knepp's talk consisted of comments on a series of slides showing applications of phenolic casting and foam resins, and polyester and epoxy casting and laminating resins for industrial tooling, particularly for the automotive and aircraft industries. These applications include dies, die spotting fixtures, patterns, models, core boxes, duplicating and other fixtures, vacuum molds, and sample parts.

Mr. Strottman described the technique of post forming Formica laminate sheets, as well as the properties and applications of such post formed parts. The heating operation, which should be done with infrared lamps, is the critical factor in forming. The optimum forming temperature is 165° C., and the range is quite narrow; temperatures of 175-180° C. will cause blistering of the laminate; while low temperatures cause cracking. Forming should be complete within 10-15 seconds after the material has been removed from the heating position. Forming die design is also of great importance for accurate finished parts. These dies can be made of hardwood, metal, or plastics, depending on the complexity of the finished product. A demonstration of a typical right-angle forming operation was given by Stanley Zelwack to illustrate the talk.

G. Palmer Humphrey, R. C. Molding, Inc., and Section secretary-treasurer, presided over the brief business session preceding the talks, at which reports were given by the various committee chairmen. Table favors and door prizes were distributed through the courtesy of Pressman Toy Corp.

The Section held the first field trip of its history on March 10 when a delegation of more than 30 members visited Monsanto Chemical Co.'s plastics division at Springfield, Mass. All arrangements were handled by Monsanto, which supplied a private parlor car for the round trip, as well as luncheon and supper. The members heard talks on Lustrex Hi-Test 88 styrene copolymer by R. E. Hammer; Opalon vinyl resins and compounds by R. F. Hill; and polyethylene resins and products by E. S. Childs, Jr. There was also a showing of the color-sound film, "Kitcheneering," with commentary by F. W. Meuschke, showing the possibilities of plastics in kitchen design. Concluding the trip were tours of the research laboratories, cellulose nitrate sheeting plant, and vinyl film plant.

Reinforced Plastics in Jet Engines

Aircraft manufacturers are very much interested in the use of plastics as a material of construction for parts of jet engines owing to the potential savings in weight and cost that may be realized, according to Max F. Grandey, General Electric Co., Cincinnati, O. Most of the experimentation performed to date has been in relation to the use of Fiberglas-reinforced plastics such as polyester, phenolics, and silicones because of their good thermal stability. It has been found that phenolic resins are superior to the other materials for fabrication into accessory and component parts in some relatively low-temperature locations in the engine.

Speaking at the March 4 meeting of the Miami Valley Section, SPE, in Cincinnati, Mr. Grandey presented a paper entitled, "Reinforced Plastics as a Material of Construction in the Jet Engine." In it the speaker expanded the information which had been previously presented in the form of an 18-minute Walt Disney animated film on "How and Why a Jet Engine Works." He explained that the temperatures attained in the engines vary from 70° F. at the nose inlet to 400° F. in the compressor, 3,500° F. in the combustion chamber, and 1,200° F. at the tail outlet. It is in the locations forward of the combustion chamber that the successful application of thermosetting materials is probable.

Tests have indicated, reported the speaker, that the phenolic materials are superior to either of the other plastics investigated and to lightweight metals in flexural strength over a temperature range from 100-500° F. The phenolics have proved comparable to steel, he said, in view of the fact that they have superior damping properties to offset their lower fatigue strength. In addition to the weight saving that would result from the use of the plastics, it is expected that plastic parts would be cheaper since the number of operations required to produce a finished part is less than for metal. Mr. Grandey also cited the non-corrosive properties and the non-strategic classification of the materials as further recommendations for their use.

Polhemus at February Meeting

The previous meeting of the Miami Valley Section also heard a talk on reinforced plastics. On that occasion, I. B. Polhemus, of Owens-Corning-Fiberglas Corp., addressed a record audience of 78 members and guests on "Fiberglas-Filled Molding Compounds."

Other features of the dinner-meeting, which was held in Centerville, O., on February 11, included a report on the national SPE meeting in Toronto by Walter F. Oelman, Standard Molding Corp., and a discussion of the Chevrolet "Corvette" sports car that was on display. Byron W. Nelson, National Cash Register Co., reported on the assembly of the car which he had witnessed in Chevrolet's St. Louis plant.

Crazing and Stress Corrosion of Polystyrene

A discussion of a new, simplified test method for studying the effects of a number of variables (time, temperature, reagents, exposure) on the "critical elongation" of polystyrene was presented to the South Texas Section, SPE, on March 19 in Houston by Orwin G. Maxson, Dow Chemical Co., Midland, Mich. A condensation of the paper, "Crazing of Polystyrene," by E. E. Ziegler, which was given at the past SPE National Technical Conference, the address emphasized the practical interpretation of the development with the contention that many heretofore puzzling behavior histories and apparent shortcomings of the plastic can now be explained.

Besides the talk by Mr. Maxson, the dinner-meeting featured the announcement that the following men were appointed to fill the vacancies created by the transfer of William Weise, Monsanto Chemical Co., to New England: secretary, Harlan A. James, Vector Mfg. Co.; reporter and national councilman, L. B. Connelly, Eastman Chemical Products Co.; and director for the balance of 1954, Carl J. Eckenrod, Wright Mfg. Co.

Savage Discusses Polyester Resins

The St. Louis Section, SPE, was treated to an interesting talk on polyester resins by Dick Savage, of Marco products department, Celanese Corp. of America. The meeting, held February 22 at the Melbourne Hotel, St. Louis, Mo., was attended by approximately 110 members and guests.

Mr. Savage discussed his company's resins from the chemical composition of the products through manufacturing techniques and methods of lamination. A demonstration of the rapidity with which a 42-inch boat can be fabricated was presented by the speaker, by beginning manufacture at the opening of his talk and removing the cured boat from the mold when he finished speaking.

Enlivening Industrial Reports

Industrial reports need not be dull, according to William Connelly, Bakelite Co., speaking at the February 17 joint dinner-meeting of the Chicago Section, SPE, and Midwest Chapter, SPI, held in the Western Society of Engineers' Bldg., Chicago, Ill. About 110 members and guests of the two groups heard Mr. Connelly speak on "Visual Aids in Industrial Presentations."

The method of presentation can do much to enliven a report and make it interesting, the speaker declared. Visual aids are important for proper presentation, and typical aids were described and demonstrated, including the use of blow-ups of photographs and drawings to illustrate a product or process, flock boards for mounting pictures or samples, and the vertical baloptican whereby photos or drawings on a flat surface can be projected on to a screen.

SPI Plastics Exposition and Conference

SOME 12,000 visitors from all over the country, as well as Canada and Latin America, are expected to attend the sixth National Plastics Exposition, to be held at the Public Auditorium, Cleveland, O., June 7-10. The Exposition is sponsored by The Society of the Plastics Industry, Inc., which will hold its annual Plastics Conference concurrently with the show.

More than 150 companies will exhibit at the Exposition, setting a new record for the series and reflecting the growth of the plastics industry. All phases of plastics will be represented, including molders, extruders, fabricators, laminators, reinforced plastics processors, film and sheeting manufacturers, tool and mold makers, and suppliers of materials and equipment. A number of research and testing laboratories will be exhibitors for the first time.

Designed to facilitate the interchange of

(Continued on page 89)

Scientific and Technical Activities

Rubber Division, A. C. S., Louisville Meeting Technical Program Emphasizes GR-S, Neoprene, Silicone Rubber, and Testing

THE spring meeting of the Division of Rubber Chemistry of the American Chemical Society, to be held in the Brown Hotel, Louisville, Ky., April 14-16, will have a technical program of 18 papers. The technical sessions will be held on the afternoon of April 14, with Division Chairman James C. Walton, Boston Woven Hose & Rubber Co., presiding; on the morning of April 15, with Division Vice Chairman, John M. Ball, Midwest Rubber Reclaiming Co., presiding; and on the morning of April 16, with F. C. Wagner, E. I. du Pont de Nemours & Co., Inc., chairman of the local committee on arrangements, presiding.

Registration starts on the morning of April 14, and the afternoon of April 15 will be given over to plant trips. The business meeting of the Division is scheduled for 11:35 a.m., April 15, and the Division banquet for the evening of that day. Clarence E. Manion, former dean of the Notre Dame College of Law and chairman of President Eisenhower's Committee on Inter-Governmental Relations, will be the principal speaker at the Division banquet. Details of the other social aspects of the meeting were included in our March issue (page 791).

The technical program includes six papers on GR-S covering hot milling, oil extended rubber, high solids latex, etc.; three papers on neoprene dealing with vulcanization of Type W, cements, and aging of latex; two papers on silicone rubber vulcanization and compounding; five papers on testing including aging, abrasion, and testing for dynamic properties; one paper on a new accelerator, and one paper on carbon black.

The local committee on arrangements is headed by Dr. Wagner and also includes N. R. Legge, Kentucky Synthetic Rubber Corp., vice chairman and in charge of finances; J. C. Weyrich, Du Pont, plant trips; H. C. Homan, Du Pont, banquet; M. R. Broadbooks, Du Pont, ladies' entertainment; J. R. Goertz, Du Pont, program and arrangements; T. R. Linak, B. F. Goodrich Chemical Co., registration; R. M. Reed, Girdler Co., housing; N. C. Updegraff, Girdler, publicity; and W. M. Glenn, Du Pont, secretary.

Abstracts of the papers to be presented at the technical sessions, their authors (with the name of the man reading the paper, in bold face), and their company affiliations follow.

Abstracts of Papers

WEDNESDAY AFTERNOON—APRIL 14

J. C. WALTON, PRESIDING

2:00 p.m.—1. **Introductory Remarks. J. C. Walton.**

2:15 p.m.—2. **N-Substituted Alkylsulfenyl Dithiocarbamates as Accelerators of Rubber Vulcanization. J. V. Svetlik,** H. E. Railsback, C. C. Biard, Phillips Petroleum Co., Bartlesville, Okla.

Alkylsulfenyl dithiocarbamates derived from secondary amines are a new class of powerful vulcanization accelerators. The structure and molecular weight of these compounds influence their activity and effect on physical properties of rubber vulcanizates.

Clarence E. Manion

Exceptionally good scorch resistance and powerful accelerating action are conferred by some of the N,N-disubstituted-alkylsulfenyl dithiocarbamates. These are two extremely desirable characteristics of the present-day accelerator in view of the current trend toward (1) faster mixing and processing with resultant higher operating temperatures and (2) shorter curing cycles.

Comprehensive compounding data are presented using *tert*-butylsulfenyl dimethyl dithiocarbamate as vulcanization accelerator in synthetic and natural rubbers. Lower accelerator requirements and improved scorch resistance characterize this material as compared to commercial products. Tests in GR-S-1500 show stocks accelerated with *tert*-butylsulfenyl dimethyl dithiocarbamate possess greatly improved aging resistance over control stocks.

2:45 p.m.—3. **Accelerated Weathering of Various Elastomers Using a Heliostat.** G. H. Cosner and **Ray Thoman,** Gates Rubber Co., Denver, Colo.

Attempts to correlate results from accelerated weathering units with those from outdoor exposure over a range of compounds of different elastomers have been unsuccessful. This lack of success is largely due to the fact that there is no single set of values, for such variables as temperature, spectral distribution, ozone concentration, humidity, and light intensity, that can be considered representative of all test stations at all times of the year. Only by a thorough understanding of each of these variables can accelerated, outdoor-exposure and service tests be interrelated.

A heliostat, or sun-follower, was constructed which permitted specimens to face the sun continuously. This greatly increased the incident radiant energy without altering the other variables. Simultaneous exposures were made of a number of different compounds containing natural rubber, GR-S, nitrile rubber, neoprene, GR-I, and polyvinyl chloride, strained and unstrained, on the heliostat and on stationary racks facing different directions. Although no direct correlation existed between the compounds as a group over the various exposure conditions, definite trends did appear between rate and type of aging and the orientation with respect to the sun's path for each of the compounds.

By placing filters over "gum stocks" of the above elastomers on the heliostats, the effects of various portions of the sun's spectrum were noted. All the elastomers aged more rapidly the shorter the wave length of light, except GR-S, which appeared to be most rapidly degraded by visible radiation.

The results obtained in this study show that the heliostat offers great possibility as a tool for accelerated light aging. They also indicate that outdoor exposure tests should be considered in the same light as artificially accelerated tests and should be conducted under conditions as nearly equal to the expected service conditions of the product as possible.

3:10 p.m.—4. **Effect of Sulfur and Accelerator Variation upon the Rate of Oxidation and the Deterioration of Properties of Rubber Vulcanizates.** William L. Cox and **J. Reid Shelton,** Case Institute of Technology, Cleveland, O.

The variable effect of cure upon aging of rubber stocks suggested a need of further study of the effect of different types and amounts of accelerator, and different sulfur concentrations, upon the rate of oxidation of vulcanizates and the resultant deterioration of properties.

The rate of oxygen absorption increases with increased sulfur concentration in both natural rubber and GR-S black stocks. Changes in tensile strength, modulus, and ultimate elongation, resulting from the absorption of a given amount of oxygen, are only slightly affected by changes in sulfur and accelerator concentrations. Consequently, low-sulfur stocks exhibit better aging resistance.

A change in the nature of the accelerator may affect both the rate of oxidation, and the change in properties brought about by a given absorption of oxygen. For example, Santocure-accelerated stocks oxidize at a lower rate than Tuads-accelerated stocks and also exhibit a lower rate of change in tensile strength for a given amount of oxygen absorbed.

An increase in either sulfur or accelerator concentration affects the properties of the vulcanizate and the early stages of aging so as to give a stiffer stock with lower elongation, both initially and after the absorption of any given amount of oxygen. This is particularly evident with GR-S and is a major factor in the aging of GR-S vulcanizates.

3:40 p.m.—5. **The Evaluation of Commercial GR-S Polymers by Means of the Creep Test. J. G. Lichty,** R. B. Spacht, W. S. Hollingshead, Goodyear Tire & Rubber Co., Akron, O.

Statistical data on the stability of ten GR-S polymers have been obtained by means of the creep test. Eight different lots

of each polymer containing the commonly used non-discoloring and discoloring antioxidants were studied. Oil-extended polymers were omitted from this study. The same antioxidants were rated in extracted pale crepe by oxygen bomb aging and by the creep test. All data were obtained on cured gum stocks.

Ratings of the antioxidants by the creep test method were essentially the same regardless of the type of rubber used. Furthermore, this rating was the same as that obtained by the oxygen bomb aging of extracted pale crepe stocks. Differences between the stability of hot and cold polymers can be demonstrated. Variability in stability between various lots of the same polymer is shown, and comparisons are made of this variability between different polymers.

Results show that the creep test is very well adapted to demonstrate differences in stability between GR-S polymers.

4:05 p.m.—6. **Laboratory Methods of Dynamic Testing of Compounds Containing Reclaimed Rubber. J. M. Ball** and R. L. Randall, Midwest Rubber Reclaiming Co., East St. Louis, Ill.

The dynamic properties of compounds containing mixtures of reclaimed and natural rubber, and mixtures of reclaim and GR-S, are described. The compounds are test recipes only, designed to have approximately equal hardness, specific gravity, and RHC by volume. Five test methods were used: (1) Dunlop pendulum, (2) torsional hysteresis, (3) absolute hysteresis, (4) St. Joe flexometer, and (5) inclined plane hysteresis.

The results are presented with the following comparisons in mind: (1) between natural rubber and GR-S, (2) between the reclaim compounds and the new rubber controls, (3) between different proportions of reclaim, and (4) between the various test methods. The results also contain information on the rate of cure of the various compounds.

The natural rubber control compound has lower hysteresis than the GR-S control by all five methods, and this same relation between natural rubber and GR-S tends to hold also for the reclaim compounds. There are, however, important exceptions. The Dunlop pendulum and the torsional hysteresis tests agree completely for all compounds. The inclined plane hysteresis shows no significant difference between natural rubber and GR-S in the reclaim compounds. Three of the five methods show that the natural rubber compound containing reclaim in 25% substitution is comparable in dynamic properties with the straight GR-S control compound.

4:30 p.m.—7. **Changes in Branching and Distribution Effected by Milling Hot GR-S.**[1] W. K. Taft and **June Duke,** Government Laboratories, University of Akron, Akron.

Mooney, concentrated and dilute solution viscosity data obtained from milled samples of a GR-S made at 122° F. were examined by principles from which the changes in concentrated solution viscosity can be correlated with branching and in the other two viscosities with molecular weight distribution. It is indicated that the distribution is not altered significantly by milling the polymer at 90° and 180° F., but that the degree of branching is increased with time of milling up to 40 minutes. Beyond that time, branching becomes less. Milling at 250° F. apparently causes the short chains to be broken off, thus affecting the molecular weight distribution markedly, but with continued milling at this temperature, the short chains recombine rapidly with longer chain molecules to form branched chains.

Thursday Morning—April 15
John M. Ball, Presiding

9:00 a.m.—8. **Particle Size in High Solids Synthetic Latex. Maurice Morton** and W. E. Gibbs, Rubber Research Laboratories, University of Akron.

A study has been conducted on the relation among particle size, rate of polymerization, and viscosity of polybutadiene latex polymerized to high solids content (ca. 50%). The latices were prepared by means of seeded emulsion polymerization at 5° and 30° C., using seed latices with particle diameters ranging from 400 to 1600 Å.

As expected, the rate of polymerization decreases sharply with increasing particle size, owing to the marked decrease in the number of particles. The viscosity of the final latex, however, does not vary greatly with the particle size. The main difficulties occur during the polymerization itself, when the particles are swollen with monomer and hence cause a large increase in latex viscosity.

It appears advantageous, therefore, in the preparation of such high solids latex, to work with smaller particle sizes, since the gain in rate more than offsets any small increase in viscosity. A calculation of the dependence of volume fraction on particle diameter substantiates this conclusion; the volume fraction remains relatively constant for a given inter-particle distance. However, the large surface area of the smaller particle size latex may require more stabilization precautions.

9:25 a.m.—9. **Oil Types in the Oil-Extended Rubber Program.**[1] **W. K. Taft,** M. Feldon, J. Duke, R. W. Laundrie, D. Prem, Government Laboratories, University of Akron.

In the interest of standardization and reduction of numbers of oil-extended polymers, oils have been classified by types on the basis of their percentage composition defined as certain fractions. This paper reports a critical examination of the feasibility of this characterization.

In the first part of the paper dealing with the individual fractions the results indicated that: (1) Nitrogen bases caused the most rapid initial breakdown and the paraffin fraction the least. (2) The nitrogen bases (Group I) accelerated cure and gave vulcanizates whose modulus remained unaffected by extended curing. (3) The paraffins gave faster cure than the acidaffins. (4) The compatibility of the oil increased with its unsaturation.

Examination of 18 commercial oils arranged in four groups indicated that the individual fractions are essentially additive. The total nitrogen bases plus the chemically active first acidaffins accentuate heat and Banbury breakdown of the polymer. Paraffins retard the breakdown. Narrow limits of the viscosity of the oils, total nitrogen bases, and paraffins are shown to be necessary in specifications. Undesirable breakdown of the polymer can be minimized by aeration of the latex prior to masterbatching with no sacrifice in physical properties or processing. General substantiation of either the Office of Synthetic Rubber or Rostler method of classification has been obtained.

9:50 a.m.—10. **Factors Influencing the Utility of Neoprene Cements. L. S. Bake,** E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

The neoprenes as a class are probably the most useful of the synthetic rubbers for the manufacture of adhesive cements. The utility of an adhesive cement is dependent upon properties such as stability, cohesive strength, adhesion to various surfaces, length of tack retention, fabric deterioration, and resistance to elevated temperatures. This paper deals with the effect upon those properties of such variables as different types of neoprene, blends of the various types, and the effect of compounding ingredients. The greatest amount of study has been made with the various synthetic resins, but some attention is also given to those compounding ingredients which are normally used with dry neoprene stocks.

10:15 a.m.—11. **Vulcanization of the W Type of Neoprene with Combinations of a Thiuram, a Guanidine, and Sulfur. R. M. Murray** and D. C. Thompson, du Pont.

The W types of neoprene generally require the use of organic accelerators in addition to metallic oxides to effect high rates and states of cure. Certain commonly used rubber accelerators have proved effective, particularly when sulfur is present. This paper reports the effect of combinations of a thiuram and a guanidine on the vulcanization of the W types of neoprene in the presence of sulfur and metallic oxides. The compositions studied had a higher degree of processing safety relative to their cure rates than any previously reported. A two- to three-fold increase in Mooney scorch time without reduction in cure rate is realized through the use of these combinations. Results are similar for Neoprene Type W, WHV, and WRT compositions. Different types of thiurams and guanidines have been evaluated at various concentrations. The effects of curing temperature, sulfur concentration, amount and type of metallic oxide, and loading are shown. Data show Mooney scorch values, stability of uncured stocks, cure rate, and important vulcanizate properties.

10:40 a.m.—12. **The Effect of Masterbatching, Compounding, and Testing Variables on Constant Slip Abrasion Results.** L. H. Howland, **W. W. White,** and W. E. Messer, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

It has been reported that a modified Lambourn abrasion test gives results on tire treads which correlate rather well with roadwear data. However, in evaluating tire tread stocks from carbon black-GR-S masterbatches made in various ways, the results have indicated that some machine improvements would be desirable, and that more knowledge of the influence of testing, compounding, and masterbatching variables was required. As a result of this, numerous studies have been made which have resulted in considerable knowledge on the problem. Results have been obtained on the effect on abrasion of such compounding and testing variables as modulus, combined sulfur, the per cent. slip, the coefficient of friction of the test wheel, the amount of dusting and type of dust, and also the ambient temperature.

Test results obtained at various temperatures appear to be of interest in offering a laboratory abrasion test to correlate with roadwear tests performed at different seasons of the year. For testing the temperature variable, an abrasion machine has been built which has a constant temperature cabinet surrounding the test wheel and the emery wheel. The improved equipment and techniques resulting from these studies have resulted in the development of masterbatches from oils, carbon black, and high Mooney viscosity cold GR-S that appear to

[1] The work reported herein was carried out under the sponsorship of the Synthetic Rubber Division, Reconstruction Finance Corp., in connection with the government synthetic rubber program.

be improvement over previous masterbatches from these respective components.

11:05 a.m.—13. **The Influence of Surface Roughness and Porosity on the Performance of Carbon Blacks.** E. M. Dannenberg and **B. B. S. T. Boonstra,** Godfrey L. Cabot, Inc., Boston, Mass.

The surface "roughness" and porosity of carbon blacks can be estimated by the difference in surface area values determined from electron microscope measurements of particle size distribution and the Brunaur, Emmett, and Teller method of low temperature nitrogen adsorption. Calculations of surface area from electron microscope particle size distribution curves give an estimate of the external particle surfaces; whereas the gaseous adsorption method gives a value for the total specific surface which includes both the exterior surface area and the internal surface area due to porosity.

It is shown that the development of internal surface can occur without changing particle size characteristics. Examples of this phenomenon are the so-called "aftertreated" or oxidized channel blacks which are used in the ink and lacquer industries. Oil furnace blacks in any particular particle size category can be prepared having a wide range of gaseous adsorption measured surface areas. An estimate of about 15Å for the actual pore diameters has been made from considerations of the carbon black crystallite size, adsorption and desorption isotherms, and the relation of loss in weight during oxidation to the surface area increase.

Although commercial grades of oil furnace blacks are essentially non-porous, it is shown that the effects of surface area even over a normal range can be detected in rubber testing provided the rubber recipe used is critical with respect to its curing behavior. In most recipes the small range of surface areas characteristic of various sources of commercial products does not have a significant effect. Using samples of pilot-plant furnace blacks covering a wide range in surface area at constant particle size, an investigation was made of rubber performance. The rubber properties which showed consistent trends with increasing internal surface area were (1) rate and state of cure, (2) rebound resilience, and (3) electrical conductivity. High internal surface area resulted in cure retardation, lower rebound resilience, and high electrical conductivity. This latter correlation of area and electrical conductivity has led to the recent commercial introduction of highly conductive oil furnace blacks. It is postulated that cure retardation is due to the physical adsorption of accelerator or other curative ingredients on the black surfaces, and that the lowering of resilience and increase in conductivity are the result of increased carbon chain and network formation in the vulcanizates.

In order to study the effects of surface area without the complications inherent in the use of different pilot-plant samples, another group of blacks was prepared from a base raw material in the laboratory by air oxidation covering the surface area range up to 500 m^2/g. Although cure retardation in rubber was again apparent with these blacks, no effect on rebound or electrical conductivity was noted. Also observed was a significant improvement in reinforcement with increasing surface area at constant particle size, indicating the possibility that the interaction between the rubber molecules and the carbon particle surfaces has been enhanced. Preliminary evidence on this phenomenon is presented.

11:35 a.m. **Business Meeting.**

Friday Morning—April 16

F. C. Wagner, Presiding

9:00 a.m.—14. **Continuous Hot Air Vulcanization and Room Temperature Vulcanization of Silicone Rubber. D. C. Youngs** and G. M. Konkle, Dow Corning Corp., Midland, Mich.

Many fabricators have been looking forward to the day when rubber tubing and intricately shaped extrusions can be vulcanized continuously. Steamheated continuous vulcanizers have been very successfully used in making organic rubber and silicone rubber insulated wire, but it is impossible to cure extruded rubber tubing in a continuous vulcanizer because of the problem of seals at the end of the steam tube.

With a continuous hot air vulcanizer, the most complicated silicone rubber extrusions can be easily made continuously. This process is designed primarily for vulcanizing intricate extrusions that are difficult or impossible to produce commercially on conventional equipment because of sticking, collapsing, or distortion. This technique is adaptable to standard extrusion machines. It is an inexpensive and efficient way to produce continuously many types of extrusions. Pictures of the equipment will be shown. Typical properties of silicone rubber extrusions that have been vulcanized in hot air equipment will also be presented.

There have been many requests for a silicone rubber than can be used where heat cannot be applied to vulcanize the rubber. Silastic (RTV) stocks that will vulcanize, when allowed to stand at room temperature, are now available. These materials are very useful for insulating electrical equipment and as caulking compounds, bonding materials, and fabric coating. Fabricating techniques, bonding strength to various materials, and typical properties of the cured material will be discussed.

9:30 a.m.—15. **Compounding of Silicone Rubber. III. F. L. Kilbourne, Jr.,** Clinton M. Doede, Keistutis J. Stasiunas, Connecticut Hard Rubber Co., New Haven, Conn.

Earlier work with hydrophobic silica (Du Pont Fine Silica) has been extended. It has been found that superior tensile strengths are found if rubbers with molecular weights of approximately 400,000, or higher, are used.

The hydrophobic silica exerts a continuous curing action, unlike peroxides. It has been found possible and practical to retard the vulcanization rate and the overcuring tendency by the introduction of certain antioxidants. Among those upon which report is made are diphenylamine, hydroquinone monobenzyl ether, 2,6-ditertiary butyl 4-methyl phenol, paraisopropoxydiphenylamine, and the ditertiary alkyl hydroquinones. Hexachloronaphthalene also has a significant retarding action on the curing and aging.

This work defines more closely those conditions necessary to achieve high strength and will make it possible for silicone rubber to be used in wider fields of application.

9:55 a.m.—16. **Aging Stability of Neoprene Latex. II.** The Relation between Cross-Linking and the Hydrolysis of Allylic Chlorine. **D. E. Andersen** and P. Kovacic, du Pont.

The tensile strength of neoprene films prepared from latex declines as the latex ages. This work describes the changes in the chemical structure of neoprene latex particles with age. These changes are related both to the tensile strength decline and to the mechanism of vulcanization. Of the several methods for augmenting the tensile strength, this paper discusses the use of compounding materials which apparently do not act by the formation of cross-links.

It is shown that neoprene cross-links through active chlorine positions on the polymer chains while aging as a latex as well as during cure. Semi-quantitative relations are established among the number of active positions, the number of cross-links, the latex age, the time of cure, and the tensile strength.

10:25 a.m.—17. **Improved Cross-Linked Synthetic Rubbers.** R. D. Gilbert, A. H. Krause, **N. R. Legge,** Kentucky Synthetic Rubber Corp., Louisville, Ky.

Synthetic rubbers cross-linked with divinylbenzene are widely used in the footwear and mechanical goods industries to provide lower mill shrinkage, greater smoothness, and better retention of dimensions in extruded and calendered sheets than regular GR-S. Unfortunately, the cross-linking also results in decreased tensile strength and elongation in comparison with regular GR-S. The development of an improved cross-linked polymer is described.

The tensile and elongation properties of cross-linked copolymers of butadiene and styrene have been improved very significantly by providing a more homogeneous cross-linked network. This has been attained by the incremental addition of divinylbenzene and of regulator (tertiary dodecyl mercaptan). Other changes in the polymerization conditions and polymer composition have also been beneficial. Among these are the use of 41° F. polymerization temperature and an increase in the bound styrene content to 30%. The improved polymers have mill shrinkage values in the range of 20 to 30%. When compounded in a 40 phr EPC black recipe, the new polymers gave compounded Mooneys in the range of 120 to 135 ML-4′, optimal tensile values in the range of 2900 to 3100 psi., with elongations of 350 to 400%. Physical test data from laboratory and factory evaluations are described.

The theoretical considerations of this system are discussed.

10:50 a.m.—18. **Control of Molecular Weight of Butadiene-Styrene Copolymers. I.** C_4-C_{16} Mercaptans as Regulators. **T. W. Boyer** and N. R. Legge, Synthetic Rubber Corp.

In standard GR-S type of emulsion polymerization the chain regulator, generally C_{12} mercaptan, is added in the initial charge of reactants. This results in the formation of low molecular weight polymer during the initial stages of the reaction. The low molecular weight polymer, since it does not contribute greatly to tensile strength, depreciates the quality of the polymer. As the GR-S reaction proceeds, the concentration of regulator decreases and the average molecular weight increases rapidly. Control of molecular weight becomes more difficult in this latter stage.

The incremental addition of regulator has been examined as an approach to the goal of control of average molecular weight of the polymer throughout the polymerization reaction. It is postulated that this should provide more uniform polymer of better quality. Intrinsic viscosity-conversion data for 41° F. reactions with incremental addition of C_{12} or higher tertiary mercaptans showed two intervals of decreasing molecular weight as the conversion increased. This reaction was unexpected since the rate of addition of regulator was uniform. It was assumed that these phenomena were due to the slow rate of diffusion of these mercaptans and an effective increase in mercaptan concentration at the locus of

reaction when the micelles and oil phase disappeared.

Lower (than C_{12}) mercaptans with higher rates of diffusion and more water solubility were expected to reduce these fluctuations in molecular weight. However, a study of incremental addition of tertiary-C_8, C_6, and C_4 mercaptans still showed similar fluctuations. Therefore it is postulated that the reduction of polymer molecular weight during these intervals is associated with an increased amount of mutual termination.

Physical properties of polymers prepared with incremental addition of these modifiers are compared with those of standard polymers.

11:15 a.m.—19. **High Molecular Weight Butadiene-Styrene Copolymers for Oil Extension.** T. W. Boyer, **R. D. Gilbert**, N. R. Legge.

The development of very high molecular weight polymers capable of extension with high oil loadings—up to 90 parts of oil to produce 50 Mooney viscosity masterbatches—is described. The high oil capacities were obtained by reducing the amount of low molecular weight polymer normally formed in GR-S type of emulsion polymerizations.

Three modifiers, viz., tertiary dodecyl (Sulfole), mixed tertiary (MTM), and tertiary hexadecyl mercaptan were compared in butadiene-styrene copolymerizations at 41° F., using iron-pyrophosphate activation. When all the modifier was added initially, MTM produced the highest average molecular weight polymer. Tertiary hexadecyl mercaptan gave higher intrinsic viscosity values at low conversions. Sulfole gave the broadest molecular weight distribution and the lowest average molecular weight on the basis of intrinsic viscosity-conversion curves. Tertiary hexadecyl mercaptan has been considered the most acceptable modifier for the production of polymer for oil extension up to 60% conversion because its use resulted in the least formation of low molecular weight polymers during the initial stages of the reaction. Oil capacities of these polymers increased as the average molecular weight of the polymer, as measured by intrinsic viscosity, increased. Physical evaluation data for these polymers are presented.

Incremental addition of modifier reduced the amount of low molecular weight polymer and increased the oil capacity. The conditions of incremental addition of modifier to produce the highest molecular weight soluble polymer at 60% conversion are described. The oil capacity of the masterbatch, measured with reference to masterbatch Mooney or tensile, increased as the amount of low molecular weight polymer was decreased. The high oil loading permits the addition of higher-than-normal amounts of carbon black during compounding with a resultant reduction in cost. Physical test data are reported for laboratory and factory evaluations.

Modifier-free polymerizations at 41° F. were investigated. These produced gelled polymers with high oil capacity. Physical properties of oil masterbatches of the gelled polymers reflected the high oil content, but not the effects of gel. The concept of gel and its effects in this system are discussed.

The tensile strength-oil content data illustrate that the tensile strength of the masterbatch is approximately proportional to the polymer content. The oil acts only as an extender and an easy processing aid.

Activated Recipe for GR-S 1000

THE designation X-759 has been assigned to an experimental polymer which is identical with GR-S 1000 except for the type of activation and the shortstop. The experimental rubber, polymerized in an organic hydroperoxide-sugar activated recipe, has been announced by the Reconstruction Finance Corp., Office of Synthetic Rubber, which is giving consideration to the use of an activated recipe in the production of hot rubbers to increase the overall output of its plants.

In a recent article on the subject, it was concluded that polymerization by the activated formula at 122° F. "increases the polymerization capacity of a standard GR-S plant by approximately 18-31%" and produces a polymer that is "equal to or better than that produced by the conventional persulfate-catalyzed formula."[1]

Evaluation of the formula by customers will be confined to X-759. If such evaluations indicate the polymer to be equivalent to GR-S 1000, and the activated and unactivated recipes to be interchangeable, the entire line of hot dry polymers will be converted to the activated-type formulae.

A production run of X-759, scheduled for the near future, should be of sufficient volume to permit investigation by all interested consumers. Description of the polymer to be produced is as follows: 23.5% bound styrene, hydroperoxide-sugar activated, fatty acid soap emulsified, 122° F. reaction temperature, 68% conversion, carbamate shortstopped, staining stabilizer, salt-acid coagulated; mean raw Mooney viscosity, 48 ML-4.

[1] See "Development of the Activated Hydroperoxide-Dextrose Formula for Hot Rubber." R. F. McCann, R. W. Laundrie, D. Druesedow, R. S. Reynolds, INDIA RUBBER WORLD, Nov., 1953, p. 209.

Safety Is Topic at Tlargi

THE March 2 meeting of The Los Angeles Rubber Group, Inc., held in the Hotel Statler, Los Angeles, Calif., began with an afternoon technical session at which Floyd Burgner, Firestone Tire & Rubber Co. of California, spoke on "Safety in the Rubber Industry."

Some 64 members and guests attended the session and heard Mr. Burgner give a history of the development of safety practices in the rubber industry and a statistical record of accomplishments in reducing accidents. Practical phases of safety work were described, including employe training, hazards, and investigation of accident causes, and the speaker gave specific procedures for ventilation of solvent fumes, handling of toxic chemicals, and the application of mechanical safety devices on equipment.

The evening dinner-meeting, sponsored by Xylos Rubber Co., featured a talk by Roy E. Weatherby, noted big game hunter, and a showing of his film, "Safari around the World—1953." A total of 293 members and guests attended the dinner, which concluded with the distribution of door prizes contributed by Xylos. Prize winners were: D. J. Tardone, Homer Ludwick, and Dick Wells, all of Firestone; J. M. Butler, Fullerton Mfg. Co.; Floyd Price, W. J. Voit Rubber Corp.; C. O. Thompson, P-B Division of Byron Jackson Co.; Paul Colton, Arrowhead Rubber Co.; Ken Meinhardt, Plastic & Rubber Products Co.; and H. R. Fisher and L. E. Peterson, both of Goodyear Tire & Rubber Co.

Sears and LeBras Speak

W. J. SEARS, vice president of The Rubber Manufacturers Association, Inc., spoke on "Natural Rubber Quality and Supply" at the February 17 meeting of the Washington Rubber Group, held in the Pepco Auditorium, Washington, D. C., with 50 members and guests present. Mr. Sears reviewed the work of the RMA in improving natural rubber quality and reported that definite progress has been made in standardizing on quality grades, as well as in better marking and packaging. Imports of rubber in 1953 were reported as being 28% off grade as compared with orders, whereas 42% below grade imports were received in 1951.

Domestic rubber products manufacturers are carrying their campaign to improve quality of imports directly to the Far Eastern producing areas, Mr. Sears stated. Ten representatives of the United States rubber industry will meet with representatives from Malaya, Indonesia, Indo-China, Thailand, and Ceylon at a conference in Singapore to discuss the quality requirements of the American rubber market. This conference will begin on April 22 and conclude before the meeting of the International Rubber Study Group at Columbo in May. The American group will be divided about equally between manufacturers and representatives of the Rubber Trade Association.

In the business session preceding the talk, it was reported that the Group had 256 paid-up members as of February 17. George Flanagan, B. F. Goodrich Chemical Co., was appointed chairman of the nominating committee, which will report at the regular April meeting. C. C. Miller, RMA, was appointed chairman of the annual outing committee.

A special meeting of the Group was held March 1 to hear a talk by Jean LeBras, director of the laboratories of the Institut Français du Caoutchouc. Some 57 members and guests present in the Pepco Auditorium heard Dr. LeBras give a comprehensive picture of the natural rubber situation in Indo-China. Current production in this area now amounts to about 100,000 tons per year; whereas in 1945, before the Communist uprising, production was three times this figure.

Indo-China rubber is of consistently good quality, the speaker declared, because most production is by well-managed estates rather than by smallholders, and because climatic conditions encourage the propagation of high-yielding rubber trees. Owing to color limitations, this rubber is not capable of being properly graded by appearance and is sold at prices lower than its application properties would indicate.

Dr. LeBras stated that, through research by the Institut, the possibility exists that special materials may become available on the world market, such as oil and carbon black masterbatches, and reinforced rubber made by coagulation with chemical additives. Acceptance of these special materials will depend on American interest since the French Government would wish to sell most of these materials to the United States so that it could obtain dollars for foreign exchange.

Epox-S Now E-S

THE recently announced Plasticizer Epox-S, an epoxidized triester material produced by Rubber Corp. of America, Brooklyn, N. Y., will be now sold under the name "RC Plasticizer E-S." For a description of the product, see our February issue, page 662.

Gives Vulcanization Theories

FIFTY-FIVE members and guests of the Buffalo Rubber Group attended a regular dinner meeting on March 9 at the Westbrook Hotel, Buffalo, N. Y., and heard D. Beaver, Monsanto Chemical Co., speak on "The Theories of Vulcanization."

Dr. Beaver pointed out that there are many theories on the mechanism of rubber vulcanization. Particular attention was given to the theories by Fisher, dealing with the formation of hydrogen sulfide during vulcanization; Barton, in which an accelerator forms a mercaptan which reacts with zinc and finally cross-links the sulfur; and Farmer, dealing with a free-radical reaction ending with the formation of hydrogen sulfide. The speaker also discussed various vulcanization methods including the Parks method of curing with sulfur chloride without heat; the Peachey process involving hydrogen sulfide and sulfur dioxide; and non-sulfur vulcanization with chloranil and m-dinitrobenzene.

The after-dinner speaker was R. M. Glazier, National Gypsum Co., who gave an interesting and amusing talk on the products made by his firm for use by do-it-yourself home owners.

Buckler Talks on Alfin Rubbers

THE regular winter meeting of the Detroit Rubber & Plastics Group, held February 12 at the Detroit-Leland Hotel, Detroit, Mich., with more than 200 members and guests attending, featured a talk on "Alfin Rubbers" by E. J. Buckler, Polymer Corp., Ltd. Dr. Buckler's presentation included a demonstration of the polymerization reaction and a display of products made from the new rubbers.

A cocktail hour and dinner followed the technical session, with an oyster bar supplied through the courtesy of O'Connor & Choate, Inc. The after-dinner speaker was R. E. Hatch, also of Polymer, who gave a commentary on the showing of the company's film, "Polysar," dealing with the Sarnia, Ont., Canada, plant and its operations in the manufacture of synthetic rubber.

Standards for Pallets

A COMMITTEE to study and develop American standards for pallets, the platforms on which material is placed for subsequent transportation by lift-trucks or other methods, will be organized according to a vote by members of government agencies and industry at a recent meeting in the offices of the American Standards Association, New York, N. Y. The group proposed that an ASA project be initiated to undertake standardization of nomenclature, sizes, materials, and components of pallets, including sampling, inspection, and test procedures.

Latex-Cement Combination

LATICRETE, a newly developed product of cement and latex which is recommended for repairing or resurfacing concrete floors, tanks, and walls, was described by William M. MacLean, Dominion Rubber Co., Ltd., Montreal, P.Q., Canada, in a paper presented before the fourth Chemical and Petroleum Engineering Conference, The Chemical Institute of Canada, held in Montreal on March 1-2.

This combination of rubber latex and cement is said to possess the resilient and long-wearing properties of rubber and the structural characteristics of cement. Laticrete can be applied to wet or dry surfaces, requiring only soap and water cleaning of the surface prior to application. Resistant to chemical attack, abrasion, and corrosion, the product is also represented as being completely waterproof and not slippery when wet.

In another paper presented before the Conference, Vincent V. Tivy, The Foxboro Co., Foxboro, Mass., discussed "Automatic Control in the Modern Refinery."

CALENDAR

Apr.	14-16.	Division of Rubber Chemistry. A. C. S. Brown Hotel, Louisville, Ky.
Apr.	21.	New York Section, SPE. Hotel Gotham, New York, N. Y. Washington Rubber Group.
Apr.	30.	Chicago Rubber Group Inc. Furniture Club, Chicago, Ill. The Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
May	4.	The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.
May	6.	Miami Valley Section, SPE. Eaton Manor, Hamilton, O.
May	12.	Newark Section, SPE. Military Park Hotel, Newark, N. J.
May	13.	Northern California Rubber Group.
May	14.	Connecticut Rubber Group. Buffalo Rubber Group. Joint Meeting with Canadian rubber groups. General Brock Hotel, Niagara Falls, Ont., Canada.
May	16-19.	American Institute of Chemical Engineers. Spring National Meeting. Kimball Hotel, Springfield, Mass.
May	17-20.	Second Basic Materials Exposition and Conference. International Amphitheatre, Chicago, Ill.
May	19.	New York Section, SPE. Hotel Gotham, New York, N. Y. Washington Rubber Group.
June	3.	Rhode Island Rubber Club. Summer Outing.
June	4.	Miami Valley Section, SPE. Annual Golf and Picnic Meeting. Terrace Park Country Club, Terrace Park, O.
June	5.	Southern Ohio Rubber Group. Summer Outing.
June	7-10.	Sixth National Plastics Exposition and Annual Plastics Conference. The Society of the Plastics Industry, Inc., Public Auditorium, Cleveland, O.
June	8.	Buffalo Rubber Group. Summer Outing. Transit Valley Country Club, East Amherst, N. Y.
June	9.	Newark Section, SPE. Military Park Hotel, Newark, N. J.
June	10.	New York Rubber Group. Outing. Doerr's Grove, Millburn, N. J.
June	11.	Fort Wayne Rubber & Plastics Group. Summer Outing.
June	12-13.	The Los Angeles Rubber Group. Inc. Summer Outing. Hotel Miramar, Santa Barbara, Calif.
June	14-18.	American Society for Testing Materials. Annual Meeting. Sherman and Morrison hotels, Chicago, Ill.
June	18.	Akron Rubber Group. Outing. Boston Rubber Group. Summer Outing.
June	20-24.	American Society of Mechanical Engineers. Pittsburgh, Pa.
June	21-25.	International Rubber Technology Conference. London, England.
June	25.	Detroit Rubber & Plastics Group, Inc. Summer Outing.
July	13-15.	Plant Maintenance Show. Pan Pacific Auditorium. Los Angeles, Calif.
Aug.	3.	New York Rubber Group. Golf Tournament. Baltusrol Golf Club, Springfield, N. J.
Sept.	9.	Miami Valley Section, SPE. Annual Fall Outing. N.C.R. Old River Park, Dayton, O.

R. I. Rubber Club Elections

RECENT elections at the Rhode Island Rubber Club resulted in the following officers for 1954: chairman, F. W. Burger, Kleistone Rubber Co., Inc.; vice chairman, U. J. H. Malo, Cresent Co., Inc.; and secretary-treasurer, R. W. Szulik, Acushnet Process Co.

To the board of directors of the Club were elected: for one year, Gilbert Enser, Collyer Insulated Wire Co.; for two years, W. K. Priestley, United States Rubber Co.; for three years, H. W. Day, E. I. du Pont de Nemours & Co., Inc.; for four years, Harry L. Ebert, Firestone Tire & Rubber Co.; and for five years, Walter Blecharczyk, Davol Rubber Co.

Meeting dates for this year, in addition to that of April 1, include: June 3, summer outing; and November 18, fall meeting.

Gates Club Tours College

THE Colorado School of Mines played host on February 25 to the Gates Technical Club when the group toured the new million-dollar petroleum building at the college. Some of the most recent methods developed to mine and refine the state's oil deposits were explained to the visitors by faculty members, and laboratories which house oil rigs that are set up as they would be in the field were viewed.

Soap Emulsified Experimental Polymer

X-672, a mixed soap (rosin/fatty acid) emulsified staining type of cold polymer that is identical to GR-S 1500 except for the mixed soap emulsification, has been scheduled for production by the Office of Synthetic Rubber, Reconstruction Finance Corp., Washington, D. C. The action is being taken, according to RFC, in order to permit evaluation of such polymers by interested consumers.

The experimental rubber is described as follows: 23.5% bound styrene; sugar-free iron activated; 50/50 rosin/fatty acid soap emulsified; 41° F. reaction temperature; 60% conversion; carbamate shortstopped; staining stabilizer; salt-acid coagulated; and mean raw Mooney viscosity, 52 (ML-4).

NEWS of the MONTH

Washington Report by Arthur J. Kraft

The Rubber Facilities Disposal Commission indicated that "interest in the disposal program is increasing," in an interim report on March 16. At mid-March, seven purchase proposals, complete as to all terms except price, had been submitted. Also, 196 requests for plant brochures have been received. The Commissioners' impressions from visiting 25 plants are in the report.

The Commission amended its "Instructions to Bidders," to prevent unintentional disclosure of prices offered to anyone except the Commissioners, the executive director, and the chief negotiator.

RFC reduced second-quarter production of GR-S by 6,950 tons over the February 24 estimate to 106,300 tons.

The May meeting of the International Rubber Study Group in Ceylon may again be faced with a demand for a "buffer stock" of natural rubber by Malayan and Indonesian producers. A meeting with Far Eastern producers by representatives of RMA and RTA of N. Y. on quality and packing will be held in Singapore this month.

An attempt is being made in Washington to find funds to continue the Latin America rubber research and development program without asking Congress for a separate appropriation.

A survey by the Commerce Department and the Securities & Exchange Commission estimates that the rubber industry will spend about $160 million in 1954 for new plant and equipment. The 1953 expenditure was $158 million.

The Federal Trade Commission's quantity discount rule on replacement tires and tubes will be supported in the Washington District Court by the Justice Department in April.

It appears that the excise tax on tires and tubes will remain at the present rate of 5¢ a pound for tires and 9¢ a pound for tubes. The tax revision bill passed by the House in March made no provision for excise tax reduction on these products.

Rubber Disposal Commission Says Interest in Program Increasing; Acts to Protect Bidders

"Interest in the disposal program is increasing," the men charged with the responsibility of selling the government's 27 synthetic rubber plants informed President Eisenhower and Congressional leaders on March 16. The observation was made by the three-member Rubber Producing Facilities Disposal Commission in a cautiously optimistic progress report. The Commission said it had received several informal purchase proposals in recent weeks, each of them covering one or more facilities. None of these proposals included price offers; the price figure will be submitted later, probably very close to the May 27 deadline for filing formal purchase proposals.

At mid-March, seven prospective buyers, it is understood, had submitted purchase proposals, complete as to all terms except price, and more were expected in the following few weeks. This procedure is being encouraged by the Commission "to expedite discussions with all interested parties."

The Commission also reported receiving 196 requests for plant brochures from all types of industrial firms between November and mid-March. Hundreds of brochures were distributed. The Commission also received 274 requests for instructions and information; all were answered. Forty-two conferences with prospective buyers were held in this period, and interested industrial firms have been granted permission to visit plants and make their own engineering studies.

The Commission's legal staff has consulted frequently with the Justice Department, which, under the disposal law enacted last summer, must pass on the sales pattern to be recommended by the Commission when it reports to Congress next January. Other members of the Commission's staff are evaluating individual plants and developing "a great deal of information." In all, the Commission has 25 employes—all at its Washington office.

The Commissioners—Chairman Pettibone, Vice Chairman Rounds, and Member Cook—along with Executive Director Holland, Legislative Liaison Assistant Hogate, and RFC's rubber director, E. D. Kelly, visited 25 of the 27 plants on inspection trips during February and early March. Only the two Naugatuck plants remain to be inspected by the Commission. While on these trips, the Commission made contact with rubber industry executives, at both the plant and top-policy level, and generally found them bullish over the long-term prospects for synthetic rubber.

Impressions from Plant Visits

Here are "some impressions from these contacts," as reported by the Commission to the President (in a 20-minute audience March 16) and to the chairmen of the House Armed Services and Senate Banking and Currency committees later in the day:

"1. The plants have been well maintained by their present operators and are in good condition, including those in stand-by.

"2. Although the quality of synthetic rubber has been vastly improved and new types developed such as cold rubber, in the past decade there have been no basic changes in the functional process of making rubber.

"3. Properties average some ten years of operation. The degree of their obsolescence and depreciation obviously will be a matter to resolve in final negotiations for their sale. In this connection, the first two observations are relevant.

"4. Plants generally are well located in or near areas for facilitating efficient operation.

"5. There is optimism in the industry over the long-term outlook for increased demand and expanding markets for synthetic rubber.

"6. Keen competition exists among the rubber, chemical, and petroleum industries interested in buying the plants. Other companies not now engaged in synthetic rubber manufacture or its component materials, are also interested.

"7. The Commission is impressed by the sincerity displayed by industrial executives. They have indicated a firm belief that the public interest will be served best by having plant ownership in private hands. They seem to feel that they have a responsibility in making this possible by offering to purchase the plants at realistic figures which recognize the potentialities of the synthetic rubber industry.

"8. The Commission has advised all prospective buyers that it will not recommend any 'giveaway' program to Congress. Since its organization, the Commission has been guided by these basic factors:

"a. That technical information on the plants be equally available to all interested parties, regardless of size or nature of their business.

"b. That a full, fair value be obtained for the plants; that the sales pattern insure a free, competitive rubber industry and that the interest of national security be protected.

"c. That the spirit and intent of the law, as developed in committee hearings and debate in both Houses of Congress be followed."

Amends "Instructions to Bidders"

The Rubber Producing Facilities Disposal Commission acted last month to raise additional safeguards against the possibility of unintentional disclosure of the prices to be offered by prospective purchasers of the government synthetic rubber plants.

In an amendment to its Instructions to Bidders, the Commission directed bidders to submit only one copy of their proposals containing their offering price and four others complete as to all terms except price.

The copy naming the price offer will be kept sealed and available only to members of the Commission and the executive director and chief negotiator, Eugene Holland. The four other copies, which will not contain the price figure, will be used as working papers by the Commission's staff.

Under the original instructions, issued last November 25, the Commission required submittal of four copies of purchase proposals, each containing the price figure. Apparently some prospective bidders were uneasy over the chance that—with four copies moving about the staff offices—accidental disclosure might occur, tipping off

competing bidders during the seven-month period provided for negotiating plant sales.

In another amendment to these instructions the Commission made it clear that prospective purchasers of plants will be required to buy the repair parts and the component materials (work in process at the time of transfer) inventoried at the plant site. The amendment requires the purchaser to agree, at the time he enters his bid on a plant, to purchase those inventoried repair parts and component materials in the plant at the time of transfer from government to private ownership. A procedure for calculating the value of these materials is provided in the amendment. Excluded from this requirement is finished rubber at the plant at the time of transfer.

The first amendment has no bearing on the informal proposals now being encouraged by the Commission—which also are complete as to all terms but price. It applies only to the formal proposals required to be submitted to the Commission's chairman by May 27, which will be opened on that date, or soon thereafter.

The Commission has not yet decided whether to make public any data in these formal proposals, the submission of which will launch a seven-month period of negotiating between the Commission and prospective buyers. The way it looks now, little information will be disclosed prior to submission of the Commission's final report to Congress next January.

The purchase proposals to be submitted by May 27 are a far cry from firm, sealed bids—or bids of any kind. They may amount to little more than a throwing of the hat into the ring by prospective buyers. The initial offering prices are subject to negotiation between the prospective buyer and the Commission and may well be jacked up as negotiations proceed. Moreover, under the law, bidders may withdraw at any time.

It is quite conceivable that some prospective purchasers may wind up negotiating for a plant not named in their original proposal. This is more than likely in the event the bidding interest is keen, since a company outbid by another company for one plant may, later in the negotiating period, switch its effort to buying another plant.

The Commission is prepared to engage in considerable horse-trading of this sort, if required, in an effort to come up with a disposal pattern free of monopoly taint and promising the largest aggregate financial return to the government. Negotiations will not be conducted in the proverbial "goldfish bowl."

RFC Cuts GR-S Second-Quarter Production

The Reconstruction Finance Corp. estimated last month that its sales of GR-S will hit a four-year low of about 32,500 long tons in June. It gave out this figure, along with the announcement that continued declining sales will force additional production cuts, beyond those previously announced, in April, May, and June.

Production in this quarterly period, RFC said on March 18, will be trimmed to 106,300 tons (net plus oil); while sales for the period are expected to total about 108,000 tons. The difference will come out of government-held inventory, which amounted to 84,112 tons on February 28 and was expected to push upward to 86,000 tons or more at the end of March.

The revised second-quarter production figure is 6,950 tons lower than a similar estimate made public by RFC on February 24.[1] The new figure of 106,300 tons compares with a first-quarter production total of 126,316 tons and the record high output of 201,951 tons recorded in the second quarter of 1953.

The 6,950-ton cutback from the February 24 forecast will be spread throughout the quarter, with April reduced from 37,250 to 35,500 tons; May from 39,000 to 35,400 tons; and June from 37,000 to 35,400 tons. Unchanged were the previous estimates that April sales would total 38,500 tons and May sales would total 37,000 tons. The late February estimates did not include an estimate of June sales. The March 18 estimate did—placing the figure "in the order of 32,500 long tons." This is the lowest monthly sale figure since June, 1950—the month of the outbreak of hostilities in Korea.

The June sales estimate was based largely on the firm, 90-day advance orders required of larger consumers, under the RFC directive of last autumn. Their orders for June deliveries were filed with RFC during the first half of March.

RFC released the new second-quarter estimates while it was holding a regular quarterly meeting with its Rubber Industry Advisory Committee. Discussion at the meeting was described by one official as routine. The question of raising or lowering RFC's selling price (now 23¢ a pound) for GR-S was discussed, with no decision. Later in the day, RFC's rubber director, E. D. Kelly, emphasized that the agency is not considering any price change "for the foreseeable future" and noted that the agency's price policies are reviewed as a routine matter at each of these quarterly IAC meetings.

The cut-back of 6,950 tons was made possible as the result of a successful effort by RFC to get the agreement of some of its butylene suppliers to make smaller deliveries to RFC than heretofore. This was achieved in negotiating new contracts with several suppliers for the 12-month period beginning April 1. Annual contracts which expired on March 31 required RFC to take certain minimum quantities of butylene, as well as limiting the maximum deliveries required of the suppliers. Had RFC failed to get the suppliers' agreement to reduce the agency's minimum take, the RFC would have found itself unable to trim butadiene output sufficiently to permit the additional second-quarter GR-S cutback.

It now seems likely that RFC will produce somewhat less than the 608,900 long tons of synthetics—GR-S and Butyl combined—forecast for the current fiscal year in the President's budget message last January. The new second-quarter production estimate will result in an output of only 522,895 tons for GR-S, alone, in the year (July 1, 1953, to June 30, 1954), and Butyl output, though holding up fairly well, is not likely to add more than 75,000 tons to the total. RFC officials, however, remain confident that operations will net profits on the order of 13¢ per dollar of sales this year, and that there will be no need, despite the general reduction in GR-S output, to shut down any butadiene or copolymer plants.

The agency last month issued a preliminary estimate showing February sales of GR-S of 36,958 tons (net plus oil)—or about 33,000 tons excluding the oil contained in oil-extended polymers. March production was tentatively scheduled at 42,930 tons, on a net plus oil basis, or the same daily rate as sales in February, a shorter month. Butyl sales in February totaled 6,278 tons, and March output was scheduled at 5,100 tons.

February GR-S sales included 24,415 tons of LTP (net plus oil), 4,405 tons of black masterbatch (gross weight), 8,165 tons of oil masterbatch (gross), 1,690 tons of oil-black masterbatch (gross), and 3,763 tons of latex. The March production schedule included 28,600 tons of LTP, 3,800 of black masterbatch, 11,000 of oil masterbatch, 3,300 of oil black masterbatch, and 3,900 of latex.

[1] See India Rubber World, Mar., 1954, p. 798.

"Buffer Stock" Again before IRSG in Ceylon?

Efforts of several rubber producing countries to get consuming nation support for a "buffer stock" stabilization scheme may be revived next month at the annual meeting of the International Rubber Study Group, opening in Colombo, Ceylon, on May 3. This expectation has been indicated from recent discussions among producer groups in Malaya, who apparently have not given up hope for the "buffer stock" proposal, despite its flat rejection by the IRSG last year, after months of special study by a special committee.

The purpose of a "buffer stock" is primarily to stabilize the price of a material by matching available supply to demand. In times of surplus, excess supplies would be placed in a "buffer stock"—maintained by international agreement. This would keep prices from falling. This stock could be drawn against later in the event demand exceeded production, thus preventing a sharp rise in price. In short, it is designed to assure both steady prices and adequate supplies at all times.

While the IRSG came to no conclusion on the desirability of "buffer stocks," it did acknowledge that months of discussion failed to come up with agreement on a solution to the many problems involved in establishing and maintaining one. The "buffer stock" approach, it agreed, was not feasible.

Whether the matter is again brought up in Colombo apparently will depend on whether Malayan producers can swing Indonesia, the largest rubber producing country, to support a "buffer stock" for rubber. A year ago Indonesia was the most enthusiastic advocate of the "buffer stock" approach, but since then has lost interest.

The State Department's Willis Armstrong again will be the U. S. chief delegate at the forthcoming IRSG meeting. In preparation for the conference, Mr. Armstrong met with the department's rubber industry advisory committee on March 16, and another meeting likely will be held by early April. The March 16 meeting was devoted largely to working out traveling arrangements and accommodations for members of the advisory committee who plan to attend the Colombo meeting, as advisers to the official U. S. delegation.

Singapore Meeting on Quality and Packing

A number of these industry officials will be in the 16-member U. S. delegation meeting in Singapore on April 22 to discuss mutual problems with rubber producers, packers, and shippers. The three-day conference grew out of a joint proposal of The Rubber Manufacturers Association, Inc., and the Rubber Trade Association, 13 months ago to hold such a meeting in New York. Far Eastern groups countered with a proposal to hold the first meeting

in Singapore, and their invitation was accepted in late February.

The meeting of businessmen is expected to revolve about problems of rubber quality—U. S. consumer complaints of poor packing and improper grading, as well as Far Eastern producer, packer, and shipper complaints of excessive arbitration claims by their U. S. customers. This meeting will mark the first time that consumer and producer interests have met to review these problems together.

The U. S. delegation will include: W. J. Sears, vice president and chairman of the crude rubber committee, RMA; George M. Tisdale, vice president, United States Rubber Co.; W. E. Cake, managing director, plantations division, U. S. Rubber; Leonard Smith, chief statistician, U. S. Rubber; J. C. Roberts, rubber purchasing chief, Firestone Tire & Rubber Co.; W. W. Scull, purchasing chief, The B. F. Goodrich Co.; Dean Carson, business research director, Goodrich; W. E. Klippert, vice president, Goodyear Rubber Plantations Co.

Also, R. D. Young, president, RTA; S. J. Pike, Jr., president, S. J. Pike & Co., Inc.; Joseph C. Corwin, vice president, E. H. Simpson & Co.; H. H. Kuck, Jr., vice president, The Avia Co. of New Jersey; F. T. Koyle, of Carl M. Loeb, Rhoades & Co.; Donald L. Kelley, vice president, Littlejohn & Co.; William Murray, M. Rothschild & Co.; and J. J. Meenan, Holland Colombo Trading Society.

Financing of Latin American Rubber Program Still Not Settled

Government agencies were trying in late March to reach a meeting of minds on how to finance continued U. S. participation in the Latin American natural rubber research and development program. U. S. Government expenditures on the program, which has the broad aim of developing a high-yielding, disease-resistant rubber seedling to serve as the base for introducing large-scale commercial plantings, have run between $500,000 and $600,000 annually in recent years. About $550,000 will be needed in the coming fiscal year, most of it for research, and the balance for closely integrated, related development work.

The work this year, as in the past, has been handled by U. S. Department of Agriculture (USDA) scientists in overseas field research stations. The program has been conducted on a regional basis, on the premise that both the problems confronting natural rubber in Latin America and their eventual solution have regional application. USDA figures it will take another three or four years to develop proven seedlings, resistant to leaf-blight and other indigenous plant diseases, which also produce better yields than the native, wild rubber trees.

The present conflict in Washington has developed between the Foreign Operations Administration (FOA) and USDA—with private rubber manufacturers and the defense agencies in the latter camp. FOA, which has been financing the program thus far, has served notice that it will no longer do so after June 30 on the ground that the long-range research and development program, with a regional approach, does not fit in with the type of "extension" work to which FOA, under its Congressional charter, has committed its technical assistance money.

FOA places emphasis on technical assistance projects which produce quick results. Both its money and efforts are expended primarily on training—or demonstration—program, teaching farmers in the underdeveloped areas new methods to boost output. It takes only a year or two to do this work, leaving FOA's technical aid specialists free to move on to another locality—or country—and repeat the process. While much can be said for this low-budget, educational training approach as a quick-paying "pump primer," there seems to be little doubt that the Latin American rubber program—a regional approach keyed to a massive research effort—cannot and should not be cast into this too narrow, poorly suited mold.

This conviction is held strongly by the USDA scientists concerned, by the U. S. private rubber manufacturing industry, and by the government's defense agencies. It is only recently, however, that top echelon USDA officials have swung around to this view and accepted its consequences. Agriculture Secretary Benson, it is believed, has adopted the position that the present approach to Latin America's rubber program is a sound one and should not be discarded. He has also adopted its corollary—that to insure this, USDA must assume policy and operating responsibility for the rubber program.

The remaining issue is how to finance the program. The Budget Bureau has directed USDA and FOA to try for a solution which would not require an approach to Congress for a separate appropriation for the rubber program. This, they have been doing, with USDA attempting to convince FOA to assign the necessary funds from the FOA technical assistance budget, with no strings attached. If FOA remains adamant, Mr. Benson will have to go back to the Budget Bureau for authorization to approach Congress for the funds. Commerce Secretary Weeks, who took the lead in spurring his Cabinet colleague to defend the integrity of the rubber program, has indicated he will support such an appeal for funds. So, also, have rubber industry leaders and the government's defense agencies.

No Excise Tax Reduction on Tires

The tire industry will have to wait until next year to put in another bid for excise tax relief from Congress. Tires and a host of other products, upon which federal excise taxes were imposed during the Second World War, were left pretty much out in the cold by the excise tax reduction bill speeded through Congress last month.

That bill conferred its favor only on the industries and products subject to ad valorem excises—a percentage of sales price. At that, it benefited only those items currently taxed at a rate exceeding 10%. These were brought down to 10% by the bill.

The bill whipped through the House by 411 to 3 on March 10. A week later the Senate Finance Committee opened brief hearings, limiting industry testimony only to those products on which the excise rates were not changed by the House. The tire industry—manufacturers and dealers—passed this one by. They had urged gradual reduction in present rates a few months back when the bill was before the House Ways and Means Committee. In mid-March the Senate was prepared for quick action on the bill, without changing it an iota. It's expected to breeze through to the White House, to certain—if somewhat reluctant—approval.

The hope for tire and tube excise reduction next year was raised by the promise of Congressional tax writers to open a new review early next year of the excises which they refused to lower this year. Again, as this year, a lot will depend on economic conditions and how much revenue the government feels it can surrender without widening the federal deficit. Tires are taxed at the rate of 5¢ a pound; tubes at 9¢ a pound—at the manufacturer level.

Among the products which benefited from the 10% ceiling on ad valorem excises voted last month were sporting goods—reduced from 15 to 10%. Sporting goods used chiefly for school equipment already were exempt from this tax.

Industry 1954 Plant Expansion—$160 Million

The rubber products manufacturing industry plans to spend about $160 million this year on new plant and equipment, roughly the same as during last year and somewhat higher than their 1951 and 1952 outlays, according to a survey conducted during February and early March by two government agencies.

The regular annual survey of capital budgets by the Commerce Department and the Securities & Exchange Commission shows that manufacturing industries plan to lay out $11.4 billion in 1954, or 7% less than for last year. Hard-goods producers plan to cut by 10%; soft-goods industries by 4%. Small and medium sized firms expect relatively greater declines in capital outlays than do the larger companies, the survey shows.

In the hard-goods group the only significant rise is for motor vehicle and transportation equipment industries, where plant expansion is expected to top last year's figure by 20%. In the soft-goods group, the chemical industry—a major expander in the past—is scheduling $1.3 billion in new outlays, about 15% under 1953 expenditures.

The Commerce-SEC survey also elicited information on 1954 sales expectations. Manufacturers foresee a 3% sales dip. The hard-goods industries figure their sales will be off 8% from 1953 figures—which is about where they were when the survey was made. Soft-goods producers, on the other hand, expect a 3% rise for the year, which would require a moderate pickup over their current sales.

Here's a breakdown of the capital expenditures picture for the rubber products manufacturing industry: 1953, annual total, $158 million, including $34 million, January-March; $43 million, April-June; $37 million, July-September; and $44 million, October-December; 1954, estimated annual total, $160 million, including estimated $36 million, January-March; and estimated $43 million, April-June. The 1951 and 1952 annual totals, respectively, were $150 million and $154 million.

Fight to Uphold FTC Tire Discount Rule

The government is expected to file its reply during April in Federal District Court here to the long-pending industry motions seeking a permanent injunction against the Federal Trade Commission's quantity discount limit order on replacement tires and tubes.

The Q-L order prohibits tire manufacturers from granting quantity discounts greater than those customarily offered on a single, 20,000-pound carload shipment. The order is designed to protect small dealers, who can't qualify for the heavier discounts accruing to big-volume buyers. Tire makers customarily base their discounts on the annual dollar volume purchased.

The ruling, attacked by 20 tire manufacturers, a number of oil companies, some mass distributors, and some larger independent dealers, has been embroiled in litigation ever since it saw the light of day three years ago.

There was some speculation not long ago that the FTC and the Justice Department, anxious to bring the court battle to an end, would drop the order and replace it with something milder. Apparently, this will not be so. Commissioner John W. Gwynne, newest member of the FTC and the man in charge of the quantity limit case, assured the National Association of Independent Tire Dealers in March that FTC intends to stand its ground and fight the industry attacks on the Q-L order.

Summarized briefly, here's what has happened so far in the courts: First, the District Court threw out the rubber company complaints on the ground that no party could claim injury from the Q-L order until the order had been allowed to operate; the complaints of injury were premature, the court held. The tire makers appealed to the Circuit Court, which reversed the District Court, and remanded the case for trial. That was last July. Since then, the FTC and the Justice Department (Justice acts as FTC's attorney in federal courts) have considered a possible appeal to the Supreme Court, but dropped that idea, and more recently have been preparing their answers to the industry motions in District Court.

Other Industry News

Alan L. Grant Co. Now Handling Charles T. Wilson Co. Rubber Business

Alan L. Grant Co., Inc., is now handling the rubber and rubber latex business of Charles T. Wilson Co., Inc., 120 Wall St., New York 5, N. Y. The new company, which began active trading on March 15, will be located at the 120 Wall St. address and have the same telephone number and cable address of the Charles T. Wilson Co.

The original company, which has been a rubber and produce dealer since 1910, recently decided to discontinue trading in crude rubber, rubber latex, and allied commodities. Former officers of the Charles T. Wilton Co. have organized the new company to continue in the rubber end of the business. The officers of the new compay are as follows: Alan L. Grant, president; William C. Meyer and R. A. Favenza, vice presidents; and James H. Galletly, Jr., secretary and treasurer.

Mr. Grant, president of the new company, joined the London office of the Wilson company in 1919, worked for a while in the Colombo, Ceylon, branch, and from 1920 to 1923 was managing director of the Singapore office. He returned to London in 1923 and in 1925 joined the parent company in New York. Shortly thereafter he was appointed vice president and director and, in 1947, was elected president in place of C. T. Wilson, who became chairman of the board. Mr. Grant was president of the Rubber Development Corp., Washington, D. C., the government agency concerned with the purchase of rubber after the Allied reoccupation of Far Eastern rubber areas during and after World War II. He is currently chairman of the Rubber Trade Association of New York.

Mr. Mayer started his career in the rubber business in 1916 in the rubber department of W. R. Grace & Co. Except for service in the Army during World War I, he continued with the Grace firm until 1922. Mr. Mayer joined Charles T. Wilson Co. in 1922 as a salesman and advanced to the position of vice president and director. He will serve the Alan L. Grant Co. in these same capacities.

Mr. Favenza joined Charles T. Wilson in 1915, as office boy. He served in the Marine Corps during World War I and, with the exception of 3½ years spent in Colombia, South America, as a crude rubber specialist and administrative assistant for Rubber Development Corp. during and after World War II, has been associated with the Wilson firm during his entire business career. He became a vice president and director of Charles T. Wilson Co. in June, 1952, and will serve the Grant company in these same positions.

Mr. Galletly joined the Wilson organization in 1946. He had previously been employed by the Chase National Bank from 1937 to 1946, except for service in the Navy during World War II. He was elected assistant treasurer of Charles T. Wilson Co. in 1950 and treasurer in 1952. He is secretary-treasurer of the Alan L. Grant Co.

Cabot Elects New President

Thomas D. Cabot has been elected by the board of directors of Godfrey L. Cabot, Inc., Boston, Mass., to the post of president of the company. Formerly executive vice president of the carbon black firm, the new president succeeds the founder of the company, Dr. Godfrey L. Cabot, in that position. Dr. Cabot will remain chairman of the board.

Born in Cambridge, Mass., and educated at Harvard University, the new president has had a versatile and distinguished career both in public service and as an industrial and financial executive. With the Federal Government, Mr. Cabot has served in the State Department as director for international security affairs and as industrial consultant to the Technical Cooperation Administration for Egypt.

White Star I.P.S.

Thomas D. Cabot

A former president and director of United Fruit Co., Mr. Cabot is presently a director of the First National Bank of Boston, John Hancock Mutual Life Insurance Co., American Mutual Liability Insurance Co., and other firms. He is also affiliated, either as a board member or trustee, with a number of educational and financial institutions.

Vinyl Ethyl Ether Polymer Production Starts

The production on a development scale of vinyl ethyl ether polymers has been announced by Bakelite Co., New York, N. Y. The polymers, to be produced in commercial quantities, will be available in two molecular weights: relatively low-weight material, which is an extremely viscous liquid at room temperatures; and a medium-high molecular weight polymer, which is a rubber-like solid having a faint tack.

Primary use of the polymers is expected to be in pressure-sensitive adhesives where their stability, lack of color, uniformity, and other properties are required. The company reports that the polymers themselves are mutually compatible in all proportions, thus allowing the formulator wide latitude in controlling the adhesive and cohesive strength of his product.

Ball Decentralizes Management Set-Up

The initial phases of a continuing program to modernize management, manufacturing, and sales, and the shifting of operating responsibilities from Duncan C. Menzies, executive vice president and general manager, to the managers he has assembled for the company within the last four years, have been announced as virtually completed by Ball Brothers Co., Inc., Muncie, Ind. As a result, Mr. Menzies will retire from his duties as the company's chief operating executive to become vice chairman of the executive committee. He will continue to serve as a member of the board of directors of the company.

Under Mr. Menzies, Ball Brothers has become completely decentralized by division, product, and geographic location and now comprises 10 operating divisions in six industries, including rubber and plastics. In addition to changing the management organization, plants have been modernized and expanded at a cost of approximately $10,000,000 to increase the efficiency of the company.

Wallace & Tiernan Merges with Novadel-Agene

The associated companies of Wallace & Tiernan Co., Inc., and Novadel-Agene Corp. have been merged into a single organization known as Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J., according to an announcement from the company. Principal lines of activity of the new firm and of its subsidiaries include: W & T chemical feeders and materials handling equipment; Novadel organic peroxides for polyester resins; sifters and separating equipment of Richmond Mfg. Co.; and fatty acids and plasticizers of the W. C. Hardesty Co., Inc. Chairman of the board is Martin F. Tiernan.

F. G. Merckel, formerly president of W. C. Hardesty, has been elected president of the new company. R. M. Jackson has been elected executive vice president and treasurer, and G. D. Peet, vice president in charge of product engineering and development of the organization.

Responsible to Mr. Merckel in staff capacities are: H. C. Marks, director of laboratory research; David Crampton, chief chemical engineer; J. C. Cornwall, secretary of the corporation; and T. T. Quigley, assistant to the president and operational analyst.

It was also announced that W. J. Orchard, long-time general manager of Wallace & Tiernan and vice president of Novadel, has retired from active management, but will remain on the board of the organization.

Sales personnel who received appointments following the merger include: Robert T. Browning, vice president in charge of sales; William A. Hockett, director of sales of the W & T division; Russell C. Clement, manager of field sales and service; and Vincent Pisani, manager of departmental sales.

Royalty Reduction on Use of Polyisocyanates

A 50% reduction in the royalty rate on the use of polyisocyanates in elastomer-based adhesives has been announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The material, widely used in the licensed adhesives of some 60 firms, will cost 75¢ a pound instead of the $1.50 previously asked under agreements which still have 11 years to run.

Underlying the royalty slash was a desire to encourage broader use of the cements, according to the company. The lower royalty rate, in addition to a recent price reduction in the polyisocyanates themselves, should make the material more attractive to new applications.

3-D Plastic Display Signs

A new line of three-dimensional plastic illuminated signs and superstructures for display purposes is being offered by Vacuum Molding, Inc., Boonton, N. J. Adaptable for either hanging or mounting on cabinets, the units are manufactured by a vacuum forming process from Kodapak cellulose acetate sheet and feature "molded-in" stainless steel frames to hold full color transparencies or flavor strips by the "snap-in" method. Raised letters identifying the illustrated product are also "molded-in," and fluorescent lighting is employed to illuminate the sign.

N. J. Zinc Buys Cyanamid's TiO_2 Plant

The Gloucester City, N. J., titanium dioxide plant of American Cyanamid Co. will be purchased by The New Jersey Zinc Co. under a contract recently signed by the firms. The facility will be turned over to N. J. Zinc, however, only after Cyanamid's new and larger titanium dioxide plant at Savannah, Ga., has been completed and placed in operation. The new plant, now under construction, is expected to be producing in the latter part of 1955.

With the acquisition of the Gloucester City facility, N. J. Zinc will enter the titanium pigments field. Raw materials will be supplied to the plant by the Quebec Iron & Titanium Corp., a firm jointly owned by Kennecott Copper Corp. and the zinc firm. The latter company had planned to enter the titanium dioxide field for several years, but could not be assured of a constant source of titanium-bearing slag until now.

Goodrich Operations on the West Coast

The introduction of a new low-price tubeless car tire in the Los Angeles area and the establishment of a new distribution unit for tires and tubes in Arizona have been announced by The B. F. Goodrich Co., Akron, O.

The new tire, called the Safetyliner, supplements the company's original puncture-sealing tubeless tire, the "Life-Saver," which remains in the line. Advantages claimed for the Safetyliner include longer mileage than conventional tire-tube combinations and elimination of heat build-up caused by tubes. In addition to the Los Angeles sales district which comprises southern California, Arizona, and parts of Nevada, the tire is also being introduced to consumers in the San Francisco district.

The Arizona area which had been serviced from Los Angeles now has stocked supplies closer at hand with the opening of a new warehouse and office building in Phoenix. The one-story brick structure will have available the company's entire line of tires and tubes, including off-the-road and farm implement units.

Federal Latex Expands

The expansion program of Federal Latex Corp., 210 Wythe Ave., Brooklyn, N. Y., which is expected to triple present production capacity, will be completed before the summer, according to a recent announcement from the company. In addition to the new compounding and storage tanks presently being installed, arrangements are being made for corresponding increases in quality control and research facilities of the firm.

Pioneer Mills Builds New Branch

The third new branch building in as many years is now in operation as part of the distribution system of Pioneer Rubber Mills, San Francisco, Calif. Located at 5555 N. Northwest Highway in Chicago, Ill., the new facility is considered a necessary adjunct to the current expansion and modernization program at the company's factory in Pittsburg, Calif.

Reinforced Plastic Sportcars at Toy Fair

Junior's toys are keeping well abreast of Father's, as evidenced by the wide display of wares of some 1,300 manufacturers at the fifty-first American Toy Fair, held in New York, N. Y., March 8-17. Among the items that are following close on the heels of developments in the adult world are glass fiber reinforced polyester sportster cars by Inland Mfg. Corp., Buffalo, N. Y., and fishing rods by California Moulders, Inc., El Monte, Calif. The younger set is even ahead of its parents in some fields, as demonstrated by a jet rocket ship-pedal car, also fabricated of polyester resin.

The increased use of plastics in toy manufacture is also seen in the displays of slush-molded vinyl play blocks by Oak Rubber Co.; polyethylene soldiers by Tim-Mee Toys; and injection molded, three-dimensional effect, flat signs made of polystyrene by Living Plastics, Inc., to cite a few of the newer items. The nation-wide acceptance of vinyl inflatables, such as beach balls, wading pools, beach mattresses, etc., and of molded toys has caused the manufacturers to widen their lines of such articles.

Rubber masks, dolls, balls, and swimming accessories were also displayed in great quantity. Among the more recent innovations in the rubber toy field was the introduction of foam rubber products by Atla Products Corp. and Toys, Inc. Atla is marketing washable, foam filled terry-cloth animals; and Toys, Inc., has come out with a water-color kit that employs foam rubber figures as the washable surface on which the colors are applied.

The Fair, which exhibits the products of toy manufacturers to buyers from stores throughout the country, required the largest amount of floor space in the history of the event. Nine floors at both the Hotel McAlpin and the Hotel New Yorker, and permanent showrooms at 200 Fifth Ave., 1107 Broadway, and other locations were necessary to house the displays. The industry has recorded its optimistic outlook for 1954 in predicting that sales will equal 1953's record volume of $450,000,000 in manufacturers' value.

Adamson Reinforced Plastics Press

A new line of presses, designed for the manufacture of resin-reinforced plastic products, is being built by Adamson United Co., Akron, O. According to a company announcement, the presses will range in platen size from 48 by 48 inches to 84 by 168 inches (with strokes of 78 inches and 138 inches, respectively). Closing and opening speeds of 300-400 inches a minute and pressing speeds from 3-18 inches a minute will be possible with the new machines, unit pressure for which will be 100 psi. over the platen area.

Plasticizers by Tank Truck

Plasticizers manufactured by Witco Chemical Co., 260 Madison Ave., New York 16, N. Y., can now be delivered directly from plant to plant by means of two new tank trucks. Destinations east of the Rockies can be served by these units, one of which has two compartments of 1,000 gallons each, while the second has four baffled compartments of a 5,300-gallon total capacity.

1953 Safety Council Statistics and Awards

A reduction of 10% in the injuries suffered by workers of the 151 firms which competed in the annual rubber industry safety contest sponsored by the National Safety Council, Chicago, Ill., was recently reported along with the winners in the various divisions. With 400,127,000 man-hours worked in 1953, a total of 1,806 injuries was recorded for a frequency rate of 4.51 (disabling injuries per 1,000,000 man-hours). This rate is 11% less than the 5.08 rate given for 1952, when 153 rubber companies worked some 410,514,000 man-hours and reported 2,085 injuries. (For a comparison of the rubber industry with all industries for 1952, see our February, 1954 issue, page 632.)

The contest is broken down into divisions, depending on the average monthly man-hours' exposure of the contestants, as follows: Division 1, more than 400,000; Division 2, 200,001-400,000; Division 3, 100,001-200,000; Division 4, 50,001-100,000; and Division 5, under 50,000.

Final standings and accident-frequency rates of the divisions and of the winners in the divisions are given as follows:

Division 1, with an average rate of 2.77: first place, United States Rubber Co., Mishawaka Plant, 0.37 rate; second place, The Firestone Tire & Rubber Co., Akron Plant #1, 0.57 rate; and third place, Firestone, Memphis, Tenn., plant, 0.58 rate.

Division 2, with an average rate of 4.67: first, The B. F. Goodrich Co., Oaks, Pa., plant, 0.00 rate; second, Firestone, Des Moines, Iowa, plant, 0.29 rate; and third, Dominion Rubber Co., Ltd., St. Jerome, P.Q., Canada, factory, 0.42 rate.

Division 3, with an average rate of 7.39: first, Goodyear Tire & Rubber Co., South Africa, 0.52 rate; second, U. S. Rubber, Milan plant, 0.73 rate; and third, Goodyear, Sweden, 0.79 rate.

Division 4, with an average rate of 10.88: tied for first place with perfect records of 0.00: U. S. Rubber, Naugatuck; Goodrich, Cadillac, Mich., plant; Kentucky Synthetic Rubber Corp., Louisville; The Tile-Tex Division of The Flintkote Co., Chicago Heights, Ill.; Vulcanized Rubber & Plastics Co., Morrisville, Pa.; World Bestos Corp., division of Firestone, New Castle, Ind.; and Goodyear, Quebec-Ind. Centre #5.

Division 5, with an average rate of 12.10: all tied for first place with rates of 0.00: U. S. Rubber, General Laboratories, Passaic, N. J.; McCreary Tire & Rubber Co., Indiana, Pa.; Goodrich Research Center; Firestone, Christchurch, New Zealand; Firestone, Xylos Rubber Co. of California; University of Akron, Akron, O.; Goodrich, Du Bois, Pa., plant; U. S. Rubber Reclaiming Co., Inc., Cheektowaga, N. Y.; U. S. Rubber Co., Burlington plant; Firestone, Akron Retread Shop; and Fabric Fire Hose Co., Sandy Hook, Conn.

Award of Honor for Goodrich

The highest award issued by the National Safety Council, the Award of Honor, will be given to The B. F. Goodrich Co. in May in recognition of industrial accident prevention performance on a corporate-wide basis for 1953. All of the company's manufacturing facilities in Akron will also receive the Award of Honor for having reduced the injury frequency rate by 46% and the severity rate by 55% as compared to the par established by the Council for the rubber industry. Individual awards to various plants will be issued as follows: Oaks tire and tube plant, Award of Honor; Martha Mills textile plant, Troy, O., aircraft wheel and brake plant, Du Bois and Cadillac industrial products plants, Research Center, and Watertown, Mass., footwear and flooring plant (Hood Rubber Co.), all get Awards of Merit; and Riverside, N. J., industrial products plant, Certificate of Commendation.

Scrap Rubber & Plastics Institute Holds Annual Meeting

A meeting of the Scrap Rubber & Plastics Institute of the National Association of Waste Material Dealers, Inc., was held on March 15 at the Waldorf-Astoria Hotel, New York, N. Y., as part of the Association's forty-first annual convention on March 15-17.

Approximately 25 members and guests of the Institute were present at the meeting, which began with a business session at which the specification committee, headed by J. K. McElligott, A. Schulman, Inc., reported on discussions with the reclaimers to iron out differences in the latter's latest issue of scrap rubber specifications. The differences have been resolved, it was reported, and future revisions of the specifications will be made only after discussion with the Institute's members. C. V. Maudlin, the Association's Washington representative, reported on discussions with the State and Commerce Departments regarding import and export problems with scrap rubber and plastics.

Officers of the Institute were reelected unanimously in accordance with a recommendation by the nominating committee, headed by J. J. Costello, Tanney-Costello, Inc. The officers are: president, Milton Kushkin, Schulman; vice president, S. A. Tanney, Tanney-Costello; and secretary-treasurer, George W. Reid, NAWMD.

Guest speaker at the meeting was John M. Ball, Midwest Rubber Reclaiming Co., who began his talk with a showing of Midwest's sound-color film, "Behind the Scenes," which shows the company's reclaiming operations. Mr. Ball discussed the statistical picture of plastics, pointing out that polyethylene is the fastest growing plastic; the plastics industry is growing faster than the rubber industry; and that total resin production by 1955 is expected to be about three billion pounds.

Demand for plastics scrap is expected to be affected by three factors, Mr. Ball said. These are: (1) the expanding production of resin; (2) dissatisfaction with the poor quality of cheap toys made largely from certain types of scrap; and (3) expected price declines in the prices of virgin resins during the next few years.

The speaker noted that demand for scrap rubber has not been increasing as fast as the industry would like because of the rising costs of making reclaimed rubber, and competition between plastics and reclaimed rubber. Color considerations are also of importance, and light-colored scrap rubber has virtually disappeared from the market. Midwest is trying to develop new products to take the place of plastics for certain uses, Mr. Ball said. These products will require reclaimed rubber, be black in color, and be of an industrial nature where material costs, processing costs, and quality will be the controlling factors.

Hall Changes Address

The new address of The C. P. Hall Co., chemical manufacturer, is 414-418 S. Broadway, Akron 8, O. The company had previously been located in the First-National Tower in Akron.

Attapulgus-Edgar Brothers Merger Planned

Plans for the merger of Attapulgus Minerals & Chemicals Corp., Philadelphia, Pa., and Edgar Brothers Co., Metuchen, N. J., to form the American Minerals & Chemicals Corp. have been announced by the firms. Both Attapulgus, which produces fullers earth, and Edgar Brothers, which produces kaolin, will retain their identities in the merged company as separate divisions, but will have a common research organization.

Subject to ratification by directors and stockholders of the companies, the proposed merged firm will be managed by the following officers: chairman, James Deshler, now president of Edgar Brothers; president, Wright W. Gary, now president of Attapulgus; chairman of the executive committee and the research policy committee, David E. Lilienthal, now chairman of Attapulgus; executive vice president, Alfred G. Blake, now vice president of Edgar Brothers; vice president, R. H. Hubbell, Jr., now vice president of Attapulgus; and treasurer, Charles W. Nielsen, now treasurer of Edgar Brothers.

Goodyear Wheel, Brake, and Tire Clinic

New developments in Goodyear's aviation products and how they will affect the industry were explored at the sixth and largest wheel, brake, and tire clinic held recently by Goodyear Tire & Rubber Co., Akron, O. The two-day sessions were attended by 70 engineers and maintenance personnel from 19 airlines, 17 aircraft manufacturers, and the military branches, and employes of foreign firms.

The sessions consisted of panel discussions of problems by specialists in the various fields. Moderator at the wheel and brake discussions was A. C. Gunsaulus; and moderator of the tire and tube forum was C. A. Hulsemann. Both men are associated with Goodyear Aircraft Co.

N. J. Zinc Pigment Handling Cost Reduction

A method of shipping 50-pound bags of pigments that includes removing air from the packages in use for several years by The New Jersey Zinc Co., 160 Front St., New York 38, N. Y., is described in a recently published booklet. The procedure saves customers up to 33% in handling costs, according to the company.

Feature of the new method, in addition to removing the air, is the tiering of the bags in such a manner that they interlock, making possible lifting of a load without a pallet or other rigid support. New Jersey Zinc also claims that the bags occupy less space and can be stacked easier than conventional items.

Epoxy Resin Patents Licensed to Bakelite

An agreement which will permit Bakelite Co., New York, N. Y., to operate under the epoxy resin patents held or controlled by Devoe & Raynolds Co., Inc., has been announced as completed by both firms. To manufacture the resins Bakelite is presently constructing new production facilities.

Sponge Rubber Reorganizes

In a move to decentralize the expanding operations of its production and sales organizations, The Sponge Rubber Products Co., Shelton, Conn., has made a basic revision in the management responsibilities of the company by adopting a divisional type of management. Under the new setup, there now exists a division for each major product, with separate production and sales organizations, along with a staff division.

Resulting from this decision are the following divisions with their key personnel:

Sponge division—Wilbur S. Daley, general manager; Donald F. Spongler, Plant A manager; Jack M. Montefalco, manager of Plants B, C, and BF; Jack K. Strobel, sales manager for items other than automotive; W. R. Todd, Jr., assistant sales manager; and Carroll F. Daley, automotive sales manager.

Foam and hair division—Anselm Talalay, general manager; Leon Talalay, plant manager; John I. Gillis, sales manager; and Walter M. Gute, assistant sales manager.

Carpet division—Ludolf H. Dewyk, general manager; John K. Little, plant manager; and Jack Dempsey, sales manager.

Switch division—John R. Shields, Jr., general manager.

Canadian division—Frederick M. Daley, Jr., general manager.

Staff division—Earl D. Gunn, general manager; Kevin J. Kelley, personnel manager; Robert G. Nicol, purchasing agent; Samuel H. Herron, Jr., traffic manager; and John J. Corrigan, advertising manager.

BWH Distributor Moves

The Chicago division of Boston Woven Hose & Rubber Co. of Pittsburgh, a subsidiary of Boston Woven Hose & Rubber Co., Cambridge, Mass., has changed the location of its offices and warehouse facilities to 806 E. 31st St., LaGrange Park, Ill. Previously housed with the district office of the parent concern in downtown Chicago, the new move is expected to provide more prompt and efficient service to customers in that area.

Film on Basketball

A new 16-mm. sound film in black and white, entitled "Basketball Techniques," has been jointly released by United States Rubber Co., Rockefeller Center, New York 20, N. Y., and the National Basketball Association. Intended for college, high school, and sports groups, the 30-minute movie demonstrates offensive and defensive play, specialized shooting, and pattern development as followed by the professional basketball teams of the NBA. It is available free of charge from either the rubber company or the Association.

Campco Sheet Distributor

Campco rigid sheet material, made by forcing a plastic "alloy" of polystyrene and rubber through a heated die, will be distributed in the West Coast and Rocky Mountain areas by Electrical Specialty Co., San Francisco, Calif. The product is manufactured by Chicago Molded Products Corp., Chicago, Ill., in almost any length, with widths ranging from 26-58 inches and thicknesses from 0.005-0.125 inches.

Shell Epoxy Resin Plant

The new Houston, Tex., plant of Shell Chemical Corp., New York, N. Y., reputed to be the world's largest epoxy resin facility, has been put on stream. As a result, the company's output of Epon resins will be tripled.

At the same time, Shell announced the opening of a bis-phenol-A installation to supply this chemical to the resin plant, thus making the Houston facility independent of outside sources for its raw materials. (Epichlorohydrin, the other chief component of the resins, is presently manufactured by the company.)

Okonite Absorbs Subsidiary

The Okonite-Callender Cable Co., Inc., a wholly owned subsidiary of The Okonite Co., Passaic, N. J., has been merged into the parent concern as of April 1. The move will permit streamlining of certain operations and eliminate duplication of effort, according to the company.

Established in Paterson, N. J., in 1924 as a joint venture of Okonite and British Insulated Callender's Cables, Ltd., of England, the Passaic firm purchased the British organization's half-interest in 1948. Paper-insulated power cables and splicing materials will continue to be produced at the Paterson installation.

IMS Co. on Mold Release Quality

Because of "recent cheapened imitations" of the Silicone Spray Mold Release produced by Injection Molders Supply Co., Cleveland, O., the manufacturer has reiterated in a recent statement the "top quality and full value" that is being maintained in the production of its product. It is contended that no reduction in the product's costly silicone content or any change to a "wet," lower-cost propellent or to a "makeshift" container is contemplated.

The company has also announced that henceforth all shipments of the mold release will be made on a prepaid or full minimum freight allowed basis.

Conducts Salesman Contest

The Pioneer Rubber Co., Willard, O., recently sponsored a two-week contest among wholesaler salesmen for 2,000 companies through which it distributes household gloves from coast to coast.

Winner of this contest, and hailed as "The First Great Salesman of 1954," was David A. Levy, of Richmond, Ind., who represents Poirier & Lindeman Co., notions distributor, in six midwest states.

Emery Opens Cleveland Office

A new sales office and warehouse have been opened in Cleveland, O., by Emery Industries, Inc., Carew Towers, Cincinnati, O., to serve the northern Ohio accounts formerly serviced through Schibley & Ossmann, Inc.

Assigned to the new office are William J. Siemens, Jr., and William C. Sowers. Mr. Siemens formerly handled specialty products for the company in that area, some of which will be taken over by James A. Funk, operating out of Cincinnati.

Gro-Cord Elections

The results of the election of directors and officers of Gro-Cord Rubber Co., Lima, O., and of its wholly owned subsidiaries, Gro-Cord Rubber Co. of Canada, Ltd., and Alfred Hale Rubber Co., Inc., have been announced. They are as follows:

As directors of the parent company and of Hale: Winston L. Hunt, F. W. Cook, Virgil M. Knisely, Rodney P. Lien, Melvin C. Light, Forest Moor, and Harold Smith. All except Mr. Hunt have held their posts previously.

As directors of the Canadian subsidiary: all of the above with the exception of Mr. Hunt, plus J. S. McKindsey. All directors were reelected.

As officers of the parent company: Mr. Cook, chairman of the board; Mr. Moor, president; Mr. Smith, vice president and assistant treasurer; Fred J. Hobbs, vice president and factory manager; Mr. McKindsey, vice president and sales manager; Mr. Hunt, secretary and treasurer; and Mr. Light, assistant secretary. All except Mr. Hobbs were reelected to these positions.

As officers of the subsidiaries: David R. Cutler, vice president of Hale; and J. L. Sergeant, assistant secretary and treasurer of Gro-Cord of Canada. These men were also reelected to these posts.

Changes at Dayton Rubber

The realinement of two departments involved in sales promotion, advertising, and public relations, and the retirement of H. T. Burchard, assistant treasurer of the firm, were announced last month by Dayton Rubber Co., Dayton, O.

J. D. Hershey, formerly sales promotion manager of the mechanical sales division, has been appointed director of sales promotion and advertising. R. L. Wetzel, who had been in charge of both advertising and public relations, will now devote full time to directing an expanded public relations program.

Mr. Burchard, retiring after 38 years of service, had been assistant to the treasurer since 1926, in charge of payroll operations, stockholder relations, and various other financial responsibilities.

Firestone Publication Award

The nine plant publications of Firestone Tire & Rubber Co., Akron, O., have received the top gold medal award in the Company Employe Publications category of the Freedom Foundation, Valley Forge, Pa. The company and its supervisor of employe publications, Mary Kerrigan, received these honors for the second consecutive year. Such awards are given by the Foundation to American citizens, organizations, and schools for their contributions to a better understanding of the American way of life.

Hooker Plastics Sales Group

Hooker Electrochemical Co., Niagara Falls, N. Y., has formed a plastics sales group to handle the company's new fire-resistant polyester resin, Hetron. Headed by Charles Y. Cain, formerly Chicago district sales manager, the new organization will be staffed by sales representatives John P. Edwards, Carl I. Gochenour, Alexander L. Blackwell, and Robert J. Entenman.

Hewitt Buys Fremont Rubber Co.

A contract of sale to acquire the business, plant, and assets of Fremont Rubber Co., Fremont, O., has been signed by the rubber firm and Hewitt-Robins, Inc., Stamford, Conn. Consummation of the contract was scheduled for April 1.

Fremont, a producer of foam rubber and other "non-tire" rubber products with an annual sale volume of $5,000,000, was founded in 1945 by Robert P. Johnson, retiring chairman of the board. The plant is on a 40-acre plot and comprises 110,000 square feet of single-story buildings, all constructed within the last eight years. Employment at the present time is about 300.

Hewitt-Robins plans to install new foam rubber machinery and related equipment in the newly acquired plant during the next three months. At the completion of this expansion, it is expected that the foam rubber capacity of its Restfoam Division, into which the Fremont organization will be absorbed, will be increased by 30%.

In addition to the foam products, Fremont produces "cellular blown" sponge rubber and rubber and vinyl floor tile. Its purchase was necessitated, according to H-R, in order to meet increasing demands from automobile, furniture, bedding, and carpet manufacturers.

Pauls Named Carroll Agent

R. E. Carroll, Inc., Trenton, N. J., has appointed Paul J. Pauls, Inc., Plainfield, N. J., its exclusive export-import agent for all countries.

Paul J. Pauls, Inc., has been in the export business for 30 years and currently represents some of the major chemical companies. Paul J. Pauls, Inc., is currently marketing Solarite Resin #11, a rubber-like resin, for R. E. Carroll, Inc.

Witco Opens West Coast Plant

Operation of the Pacific Coast plant of Witco Chemical Co., 260 Madison Ave., New York 16, N. Y., was begun recently. Located in the Lynwood section of Los Angeles, Calif., the new facility is initially producing paint driers, but the eventual manufacture of the company's organic chemicals is planned.

The plant comprises four factory buildings on three acres of land. Its operation will be the responsibility of Arnold Hoffman, formerly of Witco's Chicago plant.

New England Sales Representative

The Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, O., has appointed Norman J. Ouellette of Plast-D-Vision Sales, Leominster, Mass., as its sales representative in the New England area.

The company has made it a policy to appoint to these positions such men who have had considerable background in the injection molding field and who are able to offer the specialized assistance needed on accessory plant equipment.

Future advertising will be along this line with the slogan, "One source, one responsibility for all accessory plant equipment."

Voit Buys Warehouse

The purchase of a 165,000-square foot building in Los Angeles, Calif., by W. J. Voit Rubber Corp., of that city, for a price in excess of $700,000 has been announced by the company. The structure, which contains 8,000 square feet of office facilities on the second floor, will be used primarily for warehousing and shipping operations and as headquarters for sales and administrative personnel.

Finishing operations on certain of the company's rubber and rubber-covered athletic equipment also will be conducted at the five-acre site, according to the firm.

Voit explains that added business has made present facilities inadequate and that the newly purchased building, in addition to expanding the capacity of the organization, will facilitate service to customers.

Sponge Rubber Elects Officers

The board of directors of Sponge Rubber Products Co., Shelton, Conn., has announced the election of the following officers of the company.

F. M. Daley, Sr., was reelected president, for the thirty-second year.

William R. Todd, Sr., was elected vice president to replace the retiring vice president, R. A. Holbrook. Mr. Todd was also renamed treasurer of the firm, a position he has held since the concern was founded.

James R. Todd was elected secretary. This Mr. Todd has been with the company since 1941 except for a tour of Army duty. Having served in various staff and production assignments, he became production manager of the Texfoam division in 1952, a post in which he will continue to be active. He was elected to the board of directors last year.

Improvements in All-Nylon Tire

Several new research developments have been incorporated into the All-Nylon Super-Cushion passenger-car tire that was introduced last year by Goodyear Tire & Rubber Co., Akron, O. Included among these advances are a newly designed tread, a modification in the compounding method for the tread rubber, and a new process for preconditioning the tire cord.

Results of these changes, according to the company, are better traction and skid resistance (up to 15%), virtual elimination of squealing on turns, increased wear (up to 12%), and further strengthening of the carcass.

The increase in the carcass strength arises from the preconditioned nylon. Regular nylon has a tendency to stretch under tension. Goodyear strives to control this stretch by chemically treating the cord and then tempering it by the new process (3-T) which involves tension, temperature, and time. As a result, the nylon is at maximum strength and resiliency when used in the tire.

Match-Book Advertising Award

The Kelly-Springfield Tire Co., Cumberland, Md., has been awarded a bronze "Joshua" plaque for the most distinguished use of match-book advertising in the automative equipment industry in 1953. A panel of leading advertisng men, under the sponsorship of the Match Industry Information Bureau, selected the tire company's efforts on the basis of a simple design which emphasized selling points of the firm's tire equipment.

Thermoset Plastics Expands

Plans for the construction of a new plant to measure 100 by 50 feet have been announced by Thermoset Plastics Ltd., Dorion, P. Q. To be located in Lindsay, Ont., the facility will manufacture plastic knuckles, elbows, etc., for automobiles.

OBITUARY

Sir Sydney Palmer

SIR SYDNEY PALMER, well-known figure in the natural rubber industry, died unexpectedly at his home in London, England, on March 9. He was 64 years old.

Sir Sydney had recently returned from a three-month inspection tour of Malaya and other countries in southeast Asia, where he had large rubber interests. Although he had retired in 1949 from his visiting agent's business of S. P. Palmer & Co., he had been active in the natural rubber field until his death. He visited this country a number of times; the most recent visit was in August, 1953, when he met with leaders of the industry in this country, in the capacity of chairman of the Rubber Growers Association of London.

The deceased had held practically every important post that his industry afforded in the course of a distinguished business career. In addition to having been director of a number of rubber companies, Sir Sydney was at various times chairman of The British Rubber Development Board, a director of the British Rubber Producers' Research Association, a member of the Colonial Office Labor Advisory Committee, and a member of the Committee of the Association of British Malaya.

He is survived by his wife.

Harry G. Eckhardt

HARRY G. ECKHARDT died of a heart attack in early February. He had been employed as purchasing agent for Lea Fabrics, Inc., Newark, N. J., which he had joined 30 years ago.

He was born in Brooklyn, N. Y., 58 years ago. He was educated in the public schools of Newark and saw service in World War I.

The deceased was a member of the Elks' Union Lodge 1583, Vehslage Lodge 225, F.&A.M., and Salaam Temple.

Lutheran funeral services were held, followed by Masonic and Elks rites. Burial was in Hollywood Memorial Park.

Mr. Eckhardt is survived by his wife.

Franklyn H. Eichhorn

FRANKLYN H. EICHHORN, 46, advertising and sales promotion manager of the Eberhard Faber Pencil Co., Newark, N. J., died February 14 in Jamaica Hospital ten days after an abdominal operation.

Mr. Eichhorn joined the company in March, 1926, in the advertising department. He was later appointed assistant advertising manager and won the post of advertising and sales promotion manager in 1940.

An active member of the company's 25-Year Club, Mr. Eichhorn was a well-known figure in the pencil making industry.

He was a second generation American of Lutheran parentage. He was graduated from Adelphi Military Academy and later attended Columbia University.

He is survived by a wife, a daughter, and his father.

Services were held February 17 at Queens Village, L. I.

Allan H. Butz

ALLAN H. BUTZ, vice president of the international division of Minnesota Mining & Mfg. Co., St. Paul, Minn., died unexpectedly of a heart attack on February 15 at Del Ray Beach, Fla., while vacationing with members of his family.

Mr. Butz was born in Ridgeway, Iowa, on January 22, 1903. He was educated at Carleton College. He joined 3M in 1925 as a laboratory helper and worked his way up in the firm through the positions of acting sales manager and sales manager of the New York office, eastern sales manager, eastern regional manager, and finally vice president in charge of sales in the international division.

The deceased was buried on February 19 at Resurrection Cemetery.

He is survived by his wife and three daughters.

NEWS ABOUT PEOPLE

P. J. Weaver has been named B. F. Goodrich Chemical Co.'s manager, sales development laboratories, at Avon Lake, O.; and **W. E. Manring** has been appointed technical service manager, plastic materials sales department, Cleveland, O. Weaver joined The B. F. Goodrich Co. in Akron in 1943 and was transferred to the Chemical company in 1944 as a chemical engineer. After holding various positions he was made a development supervisor at Avon Lake in 1947. Weaver was sent to the plastics materials sales department in Cleveland in 1951 as technical service manager.

Manring started with Goodrich Chemical in 1948 as a technical service engineer at the Avon Lake sales development laboratories, after having worked for American Cyanamid Co. for 11 years in both technical and sales capacities. In 1951 he was made a development supervisor and the following year moved to the Chemical company's Cleveland headquarters as a product engineer.

Robert D. Huntoon has been appointed associate director for physics at the National Bureau of Standards, Washington, D. C. This appointment brings the Bureau's number of associate directors to four: Dr. Huntoon; A. T. McPherson, associate director for testing; Wallace R. Brode, formerly associate director for research and now associate director for chemistry; and Nicholas E. Golovin, formerly assistant director, but now associate director for administration. A. V. Astin is NBS director. Dr. Huntoon, formerly director of the Bureau's Corona (Calif.) laboratories, brings to the newly created post of associate director for physics broad experience in the fields of atomic and nuclear physics and electronics. Dr. Huntoon, who has been with NBS since 1941, has also been designated acting chief of the Bureau's electronics division and of the NBS central radio propagation laboratory.

Albert H. Leader has been appointed district manager for the Seattle office of Anaconda Wire & Cable Co., New York, N. Y. He succeeds **Lloyd Wolfe,** who retired March 1 after 32 years with the company. Mr. Leader joined Anaconda as a sales trainee and, in 1949, was assigned to Seattle as salesman. In 1950 he toured Alaska to survey, for the company, its possibilities for electrical development. Mr. Leader is a member of the Northwest Electric Light & Power Association and a trustee of the Electrical Club of Washington.

E. William Eipper

E. William Eipper, formerly with the Oronite Chemical Division of Standard Oil Co. of California, has joined the market research and development department of Stauffer Chemical Co. and associated companies. He will be responsible to Paul Brallier, director of market research and development, and will make his headquarters in San Francisco, Calif. Mr. Eipper started in the chemical industry in 1934 with the Calco Chemical Division of American Cyanamid Co. He entered the Army in 1941 and later became director of research and general laboratories of the Ordnance Department's Picatinny Arsenal, Dover, N. J.

Robert A. Behrmann has been appointed director of purchases for Emery Industries, Inc., Cincinnati, O., to succeed **K. K. Boyd,** who was elected vice president in charge of sales some time ago. Mr. Behrmann has had considerable experience with Emery in the market development of new products and in technical service work.

William L. Milheim, William B. Sinclair, W. D. Matthews, and **J. W. Morton** have all been promoted to district sales managers in the chemical division of Celanese Corp. of America. Their respective districts are southeastern, New England, New York metropolitan, and mid-Atlantic.

Allen O. Zimmerman, manager of tire compounding, The Goodyear Tire & Rubber Co., Akron, O., is taking over (from April 1 to June 30) the duties of **John W. Denson,** chief chemist at the company's plant in Wolverhampton, England, who is transferring to the Akron offices for a refresher course in the firm's latest compounding developments. Zimmerman has been continuously associated with tire compounding and research since he joined Goodyear 37 years ago as a chemist. He later held several positions in compounding and development work and became development manager at the company's Australian plant in 1927. After five years Zimmerman returned to Akron in the research department, next served as a tire compounder, and was named to his most recent position just prior to World War II.

Denson, a native of England, has extensive background in both chemistry and metallurgy. He began at Wolverhampton for Goodyear in 1927 as an electrician. Promoted to the chemical laboratory about a year later, he was advanced to assistant chief chemist in 1946 and to his current post two years later.

Herbert D. Smith has been appointed manager of oil marketer sales for the tire division of United States Rubber Co., Rockefeller Center, New York 20, N. Y., to replace **Lawler B. Reeves,** named special assistant to the president of the company. Mr. Smith has been with the rubber company for eight years, having started in car-dealer sales in the Detroit branch. Subsequently, he was in retail and wholesale merchandising, manager of car-dealer sales, Newark district manager, and manager of petroleum marketer sales, all in the U. S. tires division. His most recent position was manager of oil marketer sales of dealer brands for the tire division.

Christy H. Madsen has been named production manager of the Naugatuck Chemical Division, United States Rubber Co., to replace **John C. H. Wendes,** who retired recently after 25 years of service. Mr. Madsen, formerly assistant production manager, was born and educated in British Columbia. He spent six years in the Canadian synthetic rubber industry before joining Naugatuck in 1949 as manager of its Borger, Tex., plant. Mr. Wendes, a native of Sweden, had been with Naugatuck since 1928 in various capacities, including operations manager for synthetic rubber production, before being appointed production manager in 1950.

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R. E. Davis, manager of sales research for Goodyear Tire & Rubber Co., delivered an address, "Advertising Impact Measurement," before a special meeting of the National Industrial Conference Board, a marketing group of some 1,000 members. Mr. Davis appeared on the afternoon panel of the one-day session at the Ambassador Hotel, Los Angeles, Calif., on March 25.

George Schiller, former production superintendent of the Buffalo, N. Y., factory of the Restfoam division of Hewitt-Robins, Inc., has been promoted to the position of production manager of that division. **R. G. Zier** has been named to succeed Mr. Schiller as production superintendent. Mr. Schiller has been with the company since 1946; he became superintendent in 1951. Mr. Zier joined Hewitt-Robins in 1940 and was general foreman of the molding department of the division until his promotion.

Cyrus E. Silling, Jr., has been appointed manager of the plastic chemicals division of Witco Chemical Co., 260 Madison Ave., New York 16, N. Y. Mr. Silling comes to Witco from the Ohio-Apex Division of Food Machinery & Chemical Corp.

Vincent Prus has been placed in charge of the rocket production program of Goodyear Aircraft Corp., Akron, O. In his new position Mr. Prus replaces **J. A. Keenan,** who has been placed in charge of special production assignments.

Howard F. Bjork, Howard I. Cramer, and **George R. Lawson** have been appointed vice presidents of Sharples Chemicals, Inc., Philadelphia, Pa., in the respective fields of manufacturing, development, and sales. Dr. Cramer, a member of the Sharples association for 13 years, is well known in the rubber industry. Prior to joining the company, he had been associated with the University of Akron as a professor of rubber chemistry, and with Goodyear Tire & Rubber Co. as a research chemist. Mr. Lawson, also well known in the rubber industry, has been a member of the firm's sales department since 1946, having held the position of a general sales manager for the past three years. Before joining the chemical company, he was associated with Hood Rubber Co., Merrimac Hat Corp., and Barrett Division of Allied Chemical & Dye Corp.

Lester E. Gigax has been appointed to the newly created post of assistant factory manager of Wooster Rubber Co., Wooster, O. A member of the Wooster staff for the past two years, Mr. Gigax was previously associated with the Niles, O., glass plant of General Electric Co. in the fields of quality control and product development.

Donald J. Sherbondy has been appointed director of industrial relations for Pittsburgh Plate Glass Co., Pittsburgh, Pa. Mr. Sherbondy has been associated with the firm's legal department as assistant counsel since 1945. As director of industrial relations, he succeeds Samuel L. H. Burk, who resigned last October.

A. G. Morrill, since 1951 director of Goodyear Tire & Rubber Co.'s soil conservation awards program, has joined the tire department staff of Goodyear's Export Co. He is being replaced in the soil conservation assignment by **A. H. Settle.** Morrill joined Goodyear in 1946 as a field representative trainee at Albany. He was a service representative and field representative there until 1950, when he transferred to Akron as a staffman in the tire sales department.

Settle has had a wide variety of service with Goodyear since 1922. He has varied experience in production and sales and has been in Goodyear's budget sales department in Akron since 1947.

Goodyear Tire & Rubber Co. has announced the following sales changes in its industrial products division: **C. O. Roome,** St. Louis district manager, retired on March 1 because of ill health; **Robert J. Burns,** former industrial products field representative at Chicago, has replaced Roome; **L. W. Adams,** southern sales manager, has taken over at Chicago for Burns; **B. E. McClelland,** field representative at Madisonville, Ky., has replaced Burns; **K. E. Reed,** field representative at Jacksonville, Fla., has gone to the Madisonville post; **P. P. Percich,** field representative at Chattanooga, Tenn., has taken over for Reed; and **H. V. Atkinson,** Atlanta, Ga., representative, replaced Percich.

A graduate of Columbia University, Roome joined Goodyear in 1937 as field representative in New Orleans, La., and became St. Louis district manager in 1946. Burns went with Goodyear in 1947, became field representative at Cincinnati in 1948, and went to Chicago in 1949.

Jules Schick
Lee H. Clark

Fabian Bachrach
Paul Kendall

Paul Kendall has been elected chairman of the board and **Lee H. Clark** has been appointed president of Sharples Chemicals, Inc., 1100 Widener Bldg., Philadelphia 7, Pa. Mr. Kendall has been with Sharples since 1927, serving as president since 1950. Mr. Clark has been with the firm for 25 years is such capacities as manager of manufacturing operations and as executive vice president.

Harry B. McClure has been appointed president of Carbide & Carbon Chemicals Co., a division of Union Carbide & Carbon Corp., New York, N. Y., to succeed **J. G. Davidson,** now chairman of Carbide & Carbon Chemicals, a member of the appropriations committee of Union Carbide, and a vice president of the parent corporation. Mr. McClure's first position with Union Carbide was as a research fellow on the Carbide & Carbon Chemicals Fellowship at the Mellon Institute of Industrial Research. He served as a technical representative for Carbide & Carbon in the Philadelphia area and was later assigned to sales development work in New York. In 1936 he became manager of the fine chemicals division. In 1944 he was elected a vice president of the company and was appointed executive vice president in June, 1953.

Woodrow D. Johnson has been made general sales manager of all textile division products at United States Rubber Co., Rockefeller Center, New York 20, N. Y. He has been with the company since October, 1952, when he started as merchandise manager of consumer fabrics. Then in January, 1953, he was named merchandise manager for all textile division products except the sale of yarns to the knitting and tufting trades.

Milton W. Melander has been appointed export sales division manager of Stauffer Chemical Co., 380 Madison Ave., New York 17, N. Y., its subsidiaries, and associated companies. Mr. Melander joined Stauffer in 1923 and was Pacific Coast export manager since 1942.

Virgil C. McQuiddy has been named sales manager of all yarns manufactured by the textile division of United States Rubber Co., and **Joseph B. Jackson** has been appointed assistant sales manager under Mr. McQuiddy. Replacing Mr. Jackson as head of the Reading, Pa., office of the firm is **R. J. Keane.** Mr. McQuiddy has been with U. S. Rubber since 1941 and served as manager of carded and combed yarns and certain synthetic yarns and industrial fabrics prior to this promotion.

© Fabian Bachrach
George R. Lawson

Howard F. Bjork

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Howard I. Cramer

Harold R. McCleary has been named manager of pigments research at the Bound Brook (N. J.) laboratories of the research division of American Cyanamid Co. Dr. McCleary joined the company in 1941 as a research chemist in the research department of the former Calco Chemical Division at Bound Brook. In 1944 he was made a group leader and in 1949, sectional director for application research. Since 1952 he was assistant manager of pigments research. Dr. McCleary has had published, in conjunction with other scientists, a number of technical papers in the field of organic reactions, dyeing of textile fibers, and related topics.

William S. Kather and **Milton C. Lauenstein** of the silicone products department of General Electric Co., Pittsfield, Mass., have been appointed sales development supervisors of water-repellent silicones and rubber fabricating silicones, respectively. Mr. Kather has been with G-E since 1950, before which he was employed by Merck & Co., and by Hodges Research & Development Co. Mr. Lauenstein joined G-E in 1951 after having been associated with Norton Co.

A. E. Polson, sales service manager of The Goodyear Tire & Rubber Co.'s chemical division, gave two talks at the recent annual meeting of The Chemical Institute of Canada. Mr. Polson delivered an address entitled, "Butadiene and Styrene Copolymers in the Paint Industry," to several hundred chemists in both Montreal and Toronto.

Nelson V. Seeger, organic research chemist of The Goodyear Tire & Rubber Co., Akron, O., gave a talk on synthetic rubber at The Polytechnic Institute of Brooklyn on February 27, before The Institute of Polymer Research, which sponsored a symposium on "Second Stage Cross-Linkage of Macromolecules." Dr. Seeger discussed Goodyear's new polyester rubber, Chemigum SL.

Ralph Harrington, advertising manager of The General Tire & Rubber Co., Akron, O., has been elected president of the Traffic Audit Bureau, Inc., which is sponsored jointly by the Association of National Advertisers, the American Association of Advertising Agencies, and the Outdoor Advertising Association. TAB sets the standards of measurement and authentication of outdoor advertising circulation.

Ward W. Killion has been named assistant sales manager for Paul-Martin Rubber Corp., Holyoke, Mass. Formerly associated with various companies, including Goodyear Tire & Rubber Co., Tyer Rubber Co., and Spencer Rubber Products, in sales capacities, Mr. Killion is a veteran of more than 18 years in the rubber industry. His addition to the staff of Paul-Martin is in line with the company's decision to expand sales in the eastern and central areas of the country.

Jan Willums, European technical representative of the Philblack export sales division of Phillips Chemical Co., Bartlesville, Okla., has been transferred from Copenhagen, Denmark, to Zurich, Switzerland. Mr. Willums had worked as a rubber technologist in Europe before joining Phillips in 1948.

S. Lloyd Sammis has been named production manager of the footwear and general products division of United States Rubber Co., New York, N. Y., to succeed **Charles L. Glaes,** who retired because of ill health after 37 years with the company. In his new capacity Mr. Sammis, who started with the company in 1928, will be responsible for manufacturing activities in the division's plants at Naugatuck and Waterbury, Conn.; Providence and Woonsocket, R. I.; Burlington, N. C.; Manchester, N. H.; Chicago, Ill.; Mishawaka and Washington, Ind.; Milan, Tenn.; Stoughton, Wis.; and Santa Ana, Calif.

Richard A. Badger has been appointed process engineer in the alkyd resin plant of General Electric Co.'s chemical materials department, Schenectady, N. Y. Mr. Badger joined G-E in 1950 as a Co-op student at the Thomson Lab. at Lynn, Mass. In July, 1952, he transferred to the Chem Met program at Pittsfield and, after various assignments on this program and the process technology program, is receiving his first permanent appointment as process engineer. Prior to joining G-E, Mr. Badger was a development chemist at Union Chemical Co.

Mark F. Murdock, chairman of the board and treasurer of M. F. Murdock Co., Akron, O., distributor of industrial rubber products, recently received a plaque commemorating 50 years of business relations with The B. F. Goodrich Co. Mr. Murdock was a salesman for that company's industrial rubber products when he decided, in 1904, to establish his own firm.

Edward A. Kern has been named manager-engineering for the General Electric Co.'s silicone products department at Waterford, N. Y. Associated with laboratory research activities at G-E's transformer division in Pittsfield, Mass., since 1942, Dr. Kern leaves his post of manager —materials and processes laboratory at the Pittsfield works for his new Waterford assignment.

John J. Hager has joined the sales staff of Indoil Chemical Co., Chicago, Ill., to represent the company in Ohio and adjacent areas. Mr. Hager had previously been manager of the automotive department of Pioneer Latex & Chemical Co., prior to which he was associated with The B. F. Goodrich Co. He replaces **Robert E. Elliott,** who has been assigned to special sales problems with headquarters in Chicago.

William F. Gerrow has been named district manager of a newly formed southeastern territory of The Goodyear Tire & Rubber Co.'s chemical division. Formerly special representative for Goodyear in Atlanta, Ga., Mr. Gerrow will remain in that city and will supervise all sales activities of chemical materials in Georgia, Florida, Alabama, Mississippi, Tennessee, and the Carolinas.

Frank W. Hightower has joined Branson Instruments, Inc., Stamford, Conn., to work on the development and adaptation of high-power ultrasonic energy generators to chemical plant processing. Dr. Hightower has more than 30 years of industrial and research experience with such firms as Goodyear Tire & Rubber Co., Barrett Division of Allied Chemical & Dye Corp., and Mellon Institute.

Kenneth H. Allen has been appointed director of purchases of Stauffer Chemical Co., its subsidiaries and associated companies. Mr. Allen, who joined Stauffer in 1944 and had previously been purchasing agent for the company's western operations, will have his headquarters in New York, N. Y.

J. C. Babcock, production manager of the Buffalo, N. Y., factory of the Restfoam division of Hewitt-Robins, Inc., has been appointed manager of operations of the company's Restfoam division, with responsibility for production at both the Buffalo and Staten Island facilities of the firm. Mr. Babcock joined the company in 1947 as a superintedent and became production manager in 1951.

Robert S. Ames, since 1951 manager of canopy and laminates operations at Goodyear Aircraft Corp., Akron, O., has been reappointed to the Subcommittee on Aircraft Structural Materials organized by the National Advisory Committee for Aeronautics. The appointee is presently on a one-year leave of absence to complete requirements of an A. P. Sloan Fellowship in the executive development program, School of Industrial Management, at Massachusetts Institute of Technology. The study will be finished in June.

Walt W. Hutchinson has been appointed field sales manager of the railway division of The Dayton Rubber Co., Dayton, O. Formerly a district manager in the same division, Mr. Hutchinson will now be headquartered in Chicago, where he will direct the field sales operations of representatives throughout the country.

Cyril R. Porthouse, president, The Pyramid Rubber Co., Ravenna, O., is participating in the annual "School for Presidents" at Boca Raton, Fla., conducted by the Young Presidents' Organization, 14 E. 28th St., New York 16, N. Y., which is composed of men who became presidents of corporations by the age of 39.

E. A. Bowditch has been appointed special eastern representative for latex foam rubber products of The General Tire & Rubber Co., Akron, O. Bowditch, former foam rubber representative in New England for Armstrong Rubber Co., will cover metropolitan New York, New Jersey, and New England. In his new position, he will make his headquarters at 320 Fifth Ave., New York, N. Y.

Herbert F. Schwarz, Sherwin-Williams Co., recently served as general chairman of the sixth annual Chicago Area Career Conference. Sponsored by the *Chicago Sun-Times,* Chicago Technical Council (of which Mr. Schwarz is a member), and the Illinois Institute of Technology, the conference sought to inform young people in that area of the opportunities available to them in various fields.

George L. Hare is now application engineer in General Electric Co.'s chemical materials department at Anaheim, Calif. Mr. Hare started with the company in 1952, in the engineering section at Anaheim. In his new capacity he will be responsible for the operation and conduct of the application engineering programs on polyesters and other resins for plastics.

Marshall N. Levin, formerly European correspondent of *Chemical Market Abstracts,* a publication of Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y., has returned to the home offices of the magazine as editor. Mr. Levin has been with the Snell organization since 1950 as a member of the publication's staff.

Monsanto Chemical Co. on March 1 appointed four product sales managers and promoted two other members of its plastics division sales department, Springfield, Mass. The sales managers with their product groups follow: **F. E. Woodill,** sheets and Vuepak; **M. G. Caine,** Opalon resins; **S. F. Sylvester,** textile resins; and **J. B. Clopton,** monomers. **J. D. Kirk** was named manager of sales training, and **Robert F. Hill,** assistant sales manager of Opalon resins and compounds.

Armstrong Cork Co., Lancaster, Pa., last month announced the following changes in its industrial division. **D. P. Paiste,** manager of felt and fibrous products department since 1951, has been made assistant general sales manager of the division; while **C. T. Potts,** since 1950 manager of the shoe products department, succeeds Mr. Paiste in his former capacity. **D. M. Smith,** assistant manager of the industrial adhesives department since 1949, has taken over Mr. Potts' former position.

C. A. Butler, Jr., since 1946 director of engineering of Diamond Alkali Co., Cleveland, O., has been promoted to the newly created post of director of commercial development and will be replaced by **Loren Scoville** as engineering director. Mr. Butler has been associated with the engineering and planning activities of Diamond since 1941. He now will be responsible for formulating and coordinating the commercial development program of the company upon completion of an Advance Management Training course at Harvard University.

Mr. Scoville, with Jefferson Chemical Co. as vice president in charge of engineering, purchasing, and operations since 1951, brings to the company nearly 25 years of process engineering experience. He has been employed by Jefferson since 1946, prior to which he was a member of the Texas Co.'s engineering staff.

Celanese Corp. of America, plastics division, has announced the following appointments to its engineering department: **H. M. Balter,** manager of development engineering; **J. N. Birmingham,** manager of plant engineering; **H. Weber,** manager of engineering services; and **W. R. Turner,** senior staff engineer.

American Cyanamid Co., Rockefeller Center, New York 20, N. Y., on March 4 announced several new appointments at its Stamford research laboratories in Stamford, Conn. In the plastics and resins department, **V. V. Lindgren** was named manager; **R. Lindenfelser,** resin development group leader; **L. E. Cadwell,** surface coatings group leader; **H. M. Day,** reinforced plastics group leader; **J. A. Melchore,** thermoplastics group leader; and **J. K. Magrane,** molding and bonding group leader. In the rubber chemicals department, **A. R. Davis** was named manager. In the process chemicals department, **W. H. Horne** was named manager; **C. G. Landes,** paper chemicals group leader; **C. S. Scanley,** applied surface chemistry group leader; **A. M. Swift,** chemical development group leader; and **J. M. Salsbury,** textile chemicals group leader. In the synthetic fibers department, **N. H. Marsh** was named manager; **E. A. Cresswell,** fibers research group leader; and **D. B. Wicker,** fibers development group

SPI Exposition

(*Continued from page 70*)

information between manufacturers and users of plastics, the Conference will stress user interests and product application problems. Special emphasis will be placed on four industries: refrigeration and air conditioning, automobiles, radio and television, and elastomeric applications. Plans call for each of these industries to supply several representatives to join in a panel discussion with plastics industry experts. The program will also include formal papers on plastics applications, and a session reviewing new materials available to fabricators.

A special newspaper, *Plastics Exposition News,* is being published to brief prospective visitors on developments in plastics that will be discussed and exhibited in Cleveland. The paper is being published in three issues, dated February, April, and May, and is being mailed to some 22,000 prospects as part of the promotion for the Exposition.

"Statement of Principles" Issued

OFFICIALS of four major associations in the plastics industry announced a "Statement of Principles by the Plastics Industry" at a press conference on March 8 in New York, N. Y. Based on the practices and policies of most manufacturers and processors in the industry, the statement enumerates four basic ethical concepts which all members of the different associations will be given an opportunity to affirm.

The concepts are as follows: (1) "understand thoroughly the properties and limitations of all plastic materials handled by us"; (2) "apply the correct plastic materials to all industrial end uses, designing and engineering them for maximum value, performance, and safety"; (3) "use great care to select the correct plastic materials for all consumer items, designing and engineering them to insure value, satisfaction, safety, and pleasure to all users"; and (4) "sell plastic materials, and all industrial and consumer items made therefrom, on the merits of the materials, applications, and design, and free of extravagant, unsupportable claims."

Signing the statement were the presidents of the four associations: William C. Foster, Manufacturing Chemists' Association, Inc.; John J. O'Connell, Society of the Plastics Industry, Inc., and president of Consolidated Molded Products Corp.; John W. LaBelle, Society of Plastics Engineers, Inc., and sales manager of Foster Grant Co.; and S. Ernest Kulp, Plastic Coatings & Film Association and Masland Duraleather Co. Brief talks hailing the statement and its value in promoting continued growth of the plastics industry were given by the signers and by Dan M. Rugg, Koppers Co., Inc., and chairman of the MCA plastics committee.

Signing the "Statement of Principles by the Plastics Industry" Are (*Left to Right*) John W. LaBelle, William C. Foster, S. Ernest Kulp, and John J. O'Connell

Treatment of Polyethylene to Permit Printing

THE availability of licenses to use The Kreidl Process, a method for making polyethylene surfaces receptive to printing inks and adhesives, has been announced by The Kreidl Chemico-Physical Co., New York, N. Y. Developed in 1948 by Dr. W. H. Kreidl, of the Viennese firm, the process can be employed on film, coated paper, and bottles in addition to conventional molded and extruded articles.

New bonds in the surface of the polyethylene are formed by "subjecting the surface of the resin to a differential heat treatment . . . while the material adjoining said surface layer is held below the minimum temperature effective for said surface treatment."[1] The treatment can be affected by "the direct action of an open flame," passing the surface close to a heating element of at least 800° C.," or "passing an article through hot air of at least 400° C.," according to the claims made in the patent.

By this method, the surface is made receptive to commercial inks to such an extent that they will not be removed by adhesive tape. The plastic can be printed either immediately after the treatment or at any time later. No change in the chemical properties or strength of the polyethylene results from the process, according to the discoverer.

The Kreidl Process has been patented and is currently being used under license in most European countries and in the United States. It is presently being offered for use under non-exclusive licenses at "moderate" royalty rates.

[1] United States patent No. 2,632,921.

FINANCIAL

Carborundum Co., Niagara Falls, N. Y., and domestic and Canadian subsidiaries. For 1953: net income, $5,721,553, equal to $3.69 a share, against $4,782,503, or $3.12 a share, in 1952; sales, $82,927,005, against $70,173,250; income taxes, $4,945,429, against $4,473,330.

Aetna-Standard Engineering Co., Pittsburgh, Pa. Second half, 1953: net income, $671,439, equal to $1.75 a common share, against $483,532, or $1.25 a share, in the 1952 half.

Allied Chemical & Dye Corp., New York, N. Y. For 1953: net income, $45,171,647, equal to $5.10 a share, compared with $40,305,400, or $4.55 a share, the year before; sales, $545,560,906, against $490,182,582; federal income and excess profits taxes, $37,278,494, against $40,111,963.

Armstrong Cork Co., Lancaster, Pa., and domestic subsidiaries. For 1953: net income, $9,264,978, equal to $5.84 a common share, against $8,685,259, or $5.47 a share, in 1952; net sales, $217,484,369 (a record figure), against $202,373,467.

Atlas Powder Co., Wilmington, Del. For 1953: net earnings, $2,231,069, equal to $4.03 a common share, against $2,021,961, or $3.21 a share, a year earlier; sales, $58,788,148 (a new high), against $52,969,883.

Sidney Blumenthal & Co., New York, N. Y. For 1953: net profit, $99,935, equal to 28¢ a share, contrasted with $519,518, or $1.44 a share, the year before.

Brown Co., Boston, Mass., and wholly owned subsidiary. Year ended November 30, 1953: consolidated net profit, $3,050,696, equal to $1.04 a common share, compared with $4,396,967, or $1.69 a share, in the preceding fiscal year; consolidated net sales, $67,197,203, against $65,638,483.

Brown Rubber Co., Inc., Lafayette, Ind. For 1953: net income, $894,356, equal to $2.37 a common share, against $862,034, or $2.29 a share, the year before.

Brunswick-Balke-Collender Co., Chicago, Ill. For 1953: net income, $265,530, equal to 32¢ a share, contrasted with $714,662, or $1.32 a share, in the preceding year.

Columbian Carbon Co., New York, N. Y. For 1953: net profit, $5,194,501, equal to $3.22 a share, against $4,336,582, or $2.69 a share, a year earlier.

Crown Cork & Seal Co., Baltimore, Md. For 1953: net profit, $1,531,823, equal to 81¢ a common share, against $862,094, or 26¢ a share, in 1952.

Crown Cork International Corp., Baltimore, Md. For 1953: net profit, $665,420, equal to $1.71 a common share, against $596,086, or $1.54 a share, in 1952.

Dewey & Almy Chemical Co., Cambridge, Mass. Year ended December 31, 1953: net profit, $1,639,000, equal to $1.79 a share, contrasted with $657,369, or 72¢ a share, the year before; net sales, $34,354,000, against $29,113,256.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. For 1953: net income, $236,000,000, equal to $4.94 a common share, compared with $224,000,000, or $4.70 a share, in the preceding year; sales, $1,750,000,000 (a new high), against $1,602,000,000.

DeVilbiss Co., Toledo, O., and wholly owned subsidiary. For 1953: net profit, $739,422, equal to $2.46 each on 300,000 capital shares, contrasted with $902,239, or $3.01 a share, in 1952; net sales, $19,053,460, against $19,981,812; income taxes, $671,670, against $1,014,581; current assets, $9,556,123, current liabilities, $2,021,484, against $9,242,986 and $1,417,595, respectively, at the end of 1952.

Diamond Alkali Co., Cleveland, O. For 1953: net income, $5,939,189, equal to $2.39 a common share, compared with $5,461,820, or $2.18 a share, in 1952; sales, $86,734,279, a record high and up 13% above the 1952 figure.

Eagle-Picher Co., Cincinnati, O., and domestic subsidiaries. Year ended November 30, 1953: net earnings, $3,242,956, equal to $3.28 each on 989,177 capital shares, contrasted with $4,035,643, or $4.08 a share, in the preceding fiscal year; net sales, $85,033,403 (a new high), against $81,893,067.

Endicott Johnson Corp., Endicott, N. Y. Year ended November 30, 1953: net profit, $2,095,120, against $2,572,161, in the previous 12 months; net sales, $140,096,792, against $142,923,701.

Farrel-Birmingham Co., Inc., and subsidiary. For 1953: net income, $2,021,625, equal to $6.22 each on 325,060 common shares, against $1,935,655, or $5.95 a share, a year earlier; net sales, $47,016,700, against $43,986,659; current assets, $20,085,445, current liabilities, $9,809,891, against $19,759,733 and $9,660,658, respectively, on December 31, 1952.

General Electric Co., Schenectady, N. Y. For 1953: net income, $165,728,000, equal to $5.75 a common share, compared with $151,720,000, or $5.26 a share, in 1952; sales, $3,128,127,000 (a new high), against $2,623,888,000; provision for federal income taxes, and renegotiation, $308,500,000, against $264,000,000.

General Motors Corp., Detroit, Mich. For 1953: net income, $598,119,478, equal to $6.71 a common share, against $558,721,179, or $6.25 a share, in 1952; net sales, $10,027,985,482, against $7,549,154,419.

The General Tire & Rubber Co., Akron, O., and subsidiaries. Year ended November 30, 1953: net income, $7,431,802, equal to $5.87 a common share, compared with $6,147,918, or $4.76 a share, in the preceding fiscal year; net sales, $205,371,098 (a record figure), against $185,914,247; income taxes, $6,553,187, against $5,934,580; current assets, $80,525,508, current liabilities, $35,812,820, against $76,997,835 and $38,807,977, respectively, on November 30, 1952.

The B. F. Goodrich Co., Akron, O. Year ended December 31, 1953: net income, $34,226,745, equal to $8.16 each on 4,194,250 common shares, compared with $32,364,008, or $7.60 each on 4,164,792 shares, in the preceding year; sales, $674,613,276 (a record), against $624,102,207; income and excess profits taxes, $53,863,000 against $57,083,000; inventories at year-end, $128,322,640, against $131,242,828; net working capital on December 31, $210,370,067, against $197,116,466.

Glidden Co., Baltimore, Md. Three months ended January 31, 1954: net profit, $1,306,141, equal to 57¢ a share, against $1,392,317 or 61¢ a share, a year earlier.

Goodall-Sanford, Inc., Reading, Mass., and subsidiaries. December half, 1953: net loss, $620,013, compared with loss of $391,706 in the 1952 period; net sales, $16,325,014, against $21,764,904.

The Goodyear Tire & Rubber Co., Akron, O., and subsidiaries. Year ended December 31, 1953: net profit, $49,323,167 (a record figure), equal to $10.28 each on 4,519,956 common shares, contrasted with $39,009,866, or $8.00 a share, in 1952; net sales, $1,210,508,783 (a new high), against $1,138,403,608; income and excess profits taxes, $68,449,753, against $69,096,511; current assets, $463,940,967, current liabilities, $62,475,598, against $480,651,064 and $83,450,259, respectively, on December 31, 1952.

Hewitt-Robins, Inc., Stamford, Conn., and domestic subsidiaries. For 1953: net earnings, $1,231,696, equal to $4.29 each on 287,051 shares, compared with $1,051,199, or $3.67 each on 286,051 shares, in the previous year; sales, $38,494,309 (a new high), against $37,364,512; federal income taxes, $1,065,000, against $1,078,550; current assets, $15,648,023, current liabilities, $5,291,105, compared with $15,506,901 and $5,191,310, respectively, on December 31, 1952.

Byron Jackson Co., Los Angeles, Calif. Year ended December 31, 1953: net profit, $1,360,719, equal to $2.57 a share, against $1,388,385, or $2.62 a share, in 1952.

Johns-Manville Corp., New York, N. Y., and consolidated subsidiaries. For 1953: net earnings, $19,661,412, equal to $6.20 each on 3,172,084 common shares, contrasted with $22,619,951, or $7.14 each on 3,166,544 shares, in 1952; net sales, $252,642,136, against 244,707,540.

Lee Rubber & Tire Corp., Conshohocken, Pa., and domestic subsidiary. Quarter ended January 31, 1954: net earnings, $261,123, equal to 94¢ each on 278,398 capital shares, compared with $394,279, or $1.42 a share, in the like period last year; net sales, $9,047,976, against $10,337,242.

Mathieson Chemical Corp., Baltimore, Md. For 1953: net profit, $18,755,813 (a new high) equal to $3.30 each on 5,456,773 common shares, compared with $14,503,152, or $2.53 each on 5,439,781 shares, the year before; sales, $243,575,544 (another record), against $215,662,550.

Sheller Mfg. Corp., Portland, Ind. For 1953: net income, $3,551,035, equal to $3.72 each on 953,280 capital shares, contrasted with $2,635,029, or $2.76 a share, in the previous year; net sales, $46,704,575, against $44,406,706; income taxes, $4,010,000, against $2,780,000.

Struthers Wells Corp., Titusville, Pa. Year ended November 30, 1953: net profit, $1,270,806, equal to $4.47 each on 259,913 common shares, compared with $1,205,300, or $4.40 each on 248,263 shares, in the preceding fiscal year; net sales, $22,983,815, against $21,711,752.

(Continued on page 126)

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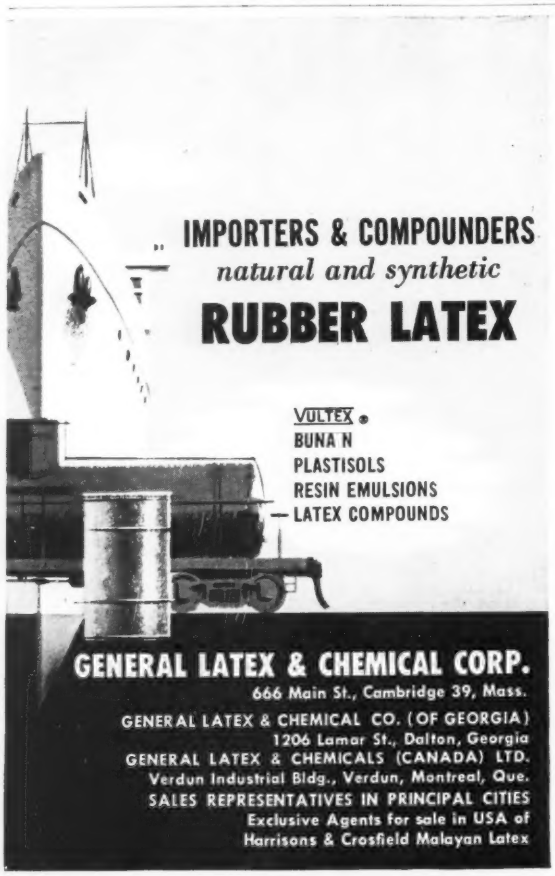
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NEWS FROM ABROAD

MALAYA

Confidence in Natural Rubber's Future Growing

The reactions of well-known personalities of the British rubber industry who have recently visited Malaya seem to agree on several counts: there are concern and some surprise over the pessimism that appears to predominate in various quarters in Malaya; confidence was expressed in the ability of natural rubber to hold its own against synthetic rubber in the long run; a realistic view of the likely future price levels for natural rubber was evident, and a robust drive to prosper in spite of them with the aid of improved methods, research, and a certain amount of government assistance, especially in the way of reduced taxation, was apparent.

The *Straits Times*, when it said editorially[1] in the course of a discussion on the future of rubber, "The planting industry will have to learn to be prosperous at well below today's prices, nor is there any reason why efficient estates and smallholders should fear this prospect," largely reflected the views of such men as Sir John Hay, managing director of Guthrie & Co., Ltd., London, and of Lord Baillieu, chairman of Dunlop Rubber Co., Ltd., who visited Malaya in February last. Both men insisted on the importance of replanting; Lord Baillieu also added that efficiency could be increased by improving living conditions for tappers, and by research. For the past three years, he stated, Dunlop has been carrying on investigations, particularly on latex, at its research center on the company's estates in Malaya.

A different aspect was presented by another February visitor to Malaya, L. J. Jiskoot, of Imperial Commodities Corp., New York, and director of the important group of natural rubber producers in Indonesia, the United Deli Companies of Sumatra. Though he could not say the immediate outlook was rosy, Mr. Jiskoot was optimistic about the future, and what with increasing new uses for rubber, foresaw a shortage of both natural and synthetic rubber.

Americans favor higher natural rubber prices, he told Malayans, because they want stable economic conditions in the Far East and also because they want to insure rubber supplies for their growing home industry. On the other hand, the factories in Akron, profiting by its low price, were taking more natural rubber and less GR-S so that production of the latter had had to be cut. If production had to be further reduced, prices of GR-S would have to be raised—to 25¢ U.S. (f.o.b.) per pound—he thought, to show some profit. When synthetic rubber plants are sold to private parties, they are likely to be controlled by the oil companies manufacturing butadiene, and the price for synthetic would certainly go up.

[1] Feb. 9, 1954.

Taylor Award Still in Dispute

The 45,000 members of five rubber workers' unions voted on the Taylor award, and all but 1% reportedly rejected it and at the same time empowered the unions to take further action, including stoppage of work. The negotiating committee of the unions notified the M.P.I.E.A. (the employers' association) of this result and requested that negotiations on wages be reopened. This request the employers refused, but offered instead to discuss Justice Taylor's recommendation that both parties examine the question of costs with the aid of professional accountants, with the aim of controlling wage fluctuations by reference to the margin between costs and proceeds instead of by direct reference to price.

The rubber workers' unions, it may be added, are supporting the efforts of the Malayan Trade Union Councils to obtain the appointment of an independent commission from the United Kingdom to examine arbitration procedure and industrial relations machinery in Malaya.

Rubber Production in 1953

Figures supplied by the International Rubber Study Group, reveal that in 1953 Malayan estates produced 341,117 tons of rubber, and smallholders, 232,589 tons, together 573,706 tons. The estate rubber came from an average total tapped area of 1,615,087

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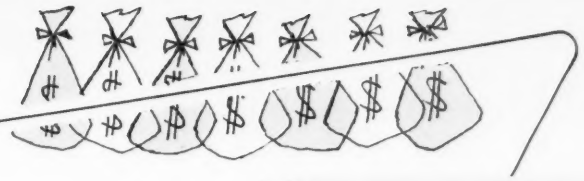

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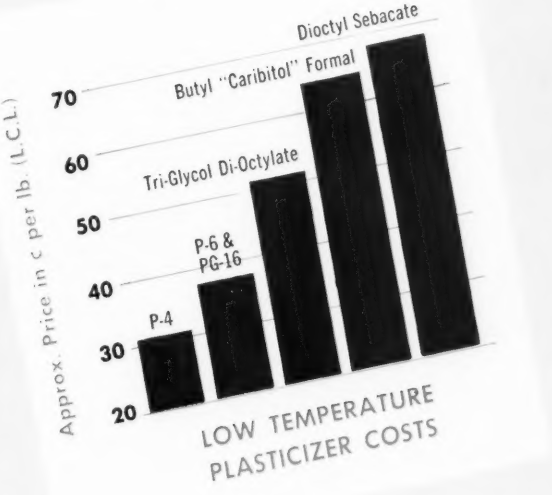

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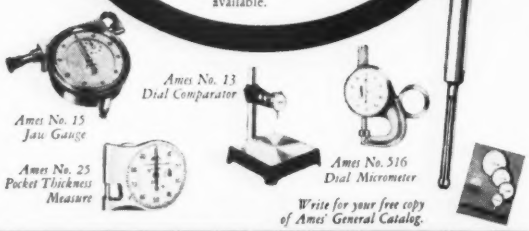

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acres, of which 429,657 acres, or 26.6% was high-yielding. The output from the latter was at the rate of 799 pounds per tapped acre, and from the remaining 1,185,430 acres of ordinary rubber, 355 pounds per acre. Over the total area, the output per tapped acre per annum worked out at 473 pounds.

European estates accounted for the greater part of the total area; next came the Chinese, followed, a long way behind, by Indian and other estates.

More than 40% of the total average tapped area of 1,127,292 acres of European estates was high-yielding, with output of 823 pounds per acre per annum; the ordinary rubber gave 372 pounds per acre, bringing the average for European estates to 504 pounds per acre per annum.

The average total Chinese area tapped in 1953 was 360,245 acres, of which a little more than 20% was high-yielding, producing 747 pounds per tapped acre per annum; the ordinary rubber gave 331 pounds; the yield over the whole was 415 pounds per tapped acre per annum.

Production of liquid latex in Malaya totaled 71,816 tons in 1953, against the 1950 peak of 73,616 tons, and the 1952 total of 47,625 tons. The 1953 output included the following types of liquid latex:

	Under 59%	59–62%	Over 62%	Total
Preserved field latex, tons*	178	—	—	178
Cream concentrate	294	2,666	9,310	12,270
Centrifuged concentrate	1,277	51,776	1,561	54,614
Any other types, including Revertex	—	—	—	4,754
TOTAL				71,816

*Amounts are in long tons, dry weight.

Progress in Replanting

Smallholders are showing satisfactory interest in the government's scheme to replant 500,000 acres in seven years, it has been announced. The target for the first year—1953—was reached and promises to be achieved again in 1954. The original target for 1953 had been 50,000 acres but this figure had to be reduced to 40,000 acres because work was not started until April and also because the required amount of planting material was not then available. Actually, 21,971 acres were completely replanted in seven months last year. The many smallholders who were unable to complete the whole area in 1953 were paid for what they had accomplished. The amount of replanting that was done in 1953 exceeded that of the whole period of 1946-1952, when smallholders replanted 20,317 acres in all.

The 1954 target has been set at 50,300 acres, and applications for replanting grants have been coming in at a satisfactory rate from most states. More than the quota was in fact applied for from five states. On the other hand, Johore was still lagging; whereas the quota for this state is 17,000 acres, only 7,914 acres had been applied for by early March. (The closing date for applications for the more remote areas was extended to the end of March.)

Applications covering 1,992 acres were also received for grants to permit replanting with alternative crops as coffee, tobacco, and pepper.

Notes

Leaders of the rubber industry are concerned over the attitude of young planters here. At present some 1,000 managers and assistants are employed on estates, many of them older men who will soon be retiring, and the young planters who will have to take their places are filled with pessimism and lack ambition and drive.

The Malayan rubber industry may increase its cess for rubber research and development, to enable it to meet competition from synthetic rubber. It seems that the majority of organizations represented by the Rubber Producers' Council would like to see the cess raised from 0.5-cent (Straits) on every pound of rubber exported to 0.85 cent. It is calculated that several million dollars more would thus become available.

A conference to consider quality, packing, shipments of exports, and possibly claims by Americans on Malayan shipments is to be held on April 22 at Singapore when The Rubber Manufacturers Association, Inc., and the Rubber Trade Association, both of New York, N. Y., U. S. A., will meet the Malayan Federation of Rubber Trade Associations, the Rubber Trade Association of Singapore, and the Singapore Chamber of Commerce Rubber Association. The American organizations will stop in Singapore on their way to the Rubber Study Group meeting being held in Ceylon in May.

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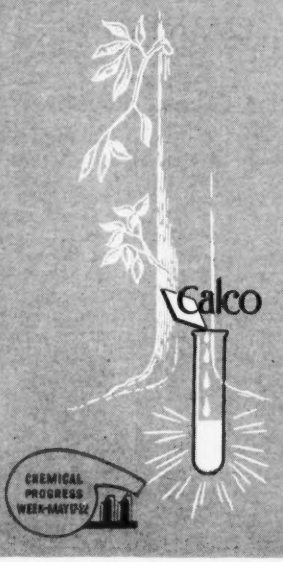

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CEYLON

Crepe Production Lost by Red China Pact

As has already been mentioned in these columns, the long-term rubber-rice pact with China has been causing difficulties because of the unfavorable position in which it has put crepe producers. The Chinese refuse to accept crepe; so the high premium on Ceylon rubber goes only to producers of sheet, and crepe rubber must find buyers in the open market at world prices. Hitherto almost half of Ceylon's rubber was in the form of crepe, but more and more producers are abandoning it in favor of sheet, which has the added advantage of also being cheaper to produce. Apart from the risk of losing the crepe market to other producing countries, Ceylon faces another problem: in order to insure the availability of the 50,000 tons of sheet a year required to fill the China contract, the government undertook to pay sheet producers the difference between the world price and the Chinese price on quantities in excess of that amount. Since excess offerings of sheet are expected to reach 20,000 tons if the big difference in sheet crepe prices is kept up, the government finds itself forced to cut prices to sheet producers. In 1953 the price paid by the Ceylon Rubber Commission for sheet was R.1.35 (28¢ U.S.); following the conclusion of the 1954 agreement at roughly 4d. under the 1953 level, the government at first decided to pay R.1.20 (25¢ U.S.) as from December 21, 1953, but has now cut the rate to R.1.10 (23¢ U.S.) per pound.

Thus it is hoped to slow down the conversion to sheet, but crepe manufacturers still have the same problem of low prices in the face of rising costs, and they have asked the Government for a reduction in export duty or grants-in-aid.

Side by side with the switch from crepe another change has been noted—an increase in latex production. Reports indicate that this change came just in time for the Latex Corp. here (an associate of Dunlop), which apparently was very near to closing its collection department. Now, however, it is said to be taking on an increasing quantity of latex.

While the pact has thus brought new problems, it has assured another year of stabilized, profitable prices for sheet, permitting the government to continue its scheme for rehabilitating rubber plantations under which it pays growers £52 to £75 ($146-210 U.S.) an acre to replant old rubber with high-yielding material. About 7,500 acres should have been replaced by the end of 1953, and a further 18,000 to 20,000 acres are scheduled to be planted in 1954. Money for this purpose comes from the Rubber Rehabilitation Fund formed by a contribution on the price of each pound of rubber sold to Communist China. In 1953 this contribution was 10 cents per pound. (2¢ U.S.) and the total sum accumulated for the year has been put at R.12,000,000 ($2,520,000). Approximately the same amount is expected in 1954, although the contribution is to be reduced to nine cents per pound (2¢ U.S.).

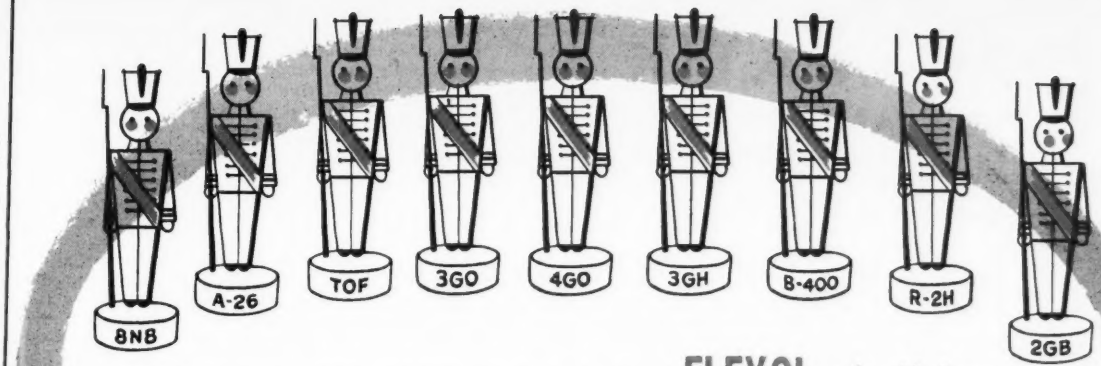
GERMANY

For a Better Rubber Industry

Various problems and aims of the German rubber industry were discussed at the annual meeting of the German rubber manufacturers' association, usually referred to as the WdK, (Wirtschaftsverband der deutschen Kautschukindustrie), held at Travemunde on June 26.

The association's president, Carl Ruger, general manager of the Metzeler A. G., Munich, spoke of the progress made in Germany in the eight years since the end of the war—emphasizing that the rapid rate and wide extent of this progress would have been impossible without generous foreign aid, especially from the United States. But this satisfactory development, he continued, should not blind the German industry to the need of strengthening its competitive position in the foreign markets, by insuring that competition by Germans, both at home and abroad, is on a sound basis.

The WdK has joined other important industrial organizations in efforts to obtain the necessary legal provision—specifically reasonable cartel laws—to achieve this end. New cartel laws have been under discussion for some time, but the rigid stand of those for and against cartels has thus far delayed final decisions. Recent proposals, however, indicate a trend toward a rapprochement of the opposing parties, suggesting the possibility of a compromise on the question of cartels. Such a compromise, Ruger holds, is essential for German industry; it cannot afford unrestricted competition and the resultant price war, and since these problems cannot be solved by legislation—no country on



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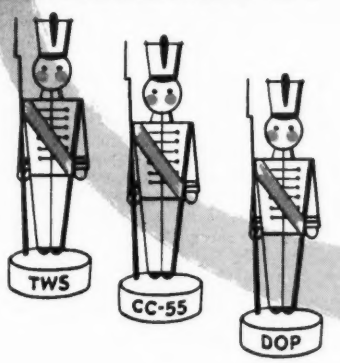

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earth has yet been able to define legally where normal competition ends and under-cutting begins—the government should leave what it cannot control to sensible regulation by industry itself.

It may here be noted that recent company reports reveal that price cutting has already become a matter for concern.

Turning to the American Rubber Manufacturers Association's proposed international standards for trading natural rubber, Ruger indicated the willingness of his organization to cooperate.

He went on to state that the WdK is intensively studying the financial aspects of erecting a new German synthetic rubber factory to produce 30,000 tons a year—what capital would be required, at what price the product could be sold, and whether this would guarantee successful competition with foreign producers of synthetic rubber. Only when the latter question is positively answered, he insisted, can there be any thought of building a new German synthetic rubber factory. He referred again to the possibility of an arrangement with France and Italy —the former of which would like to divert part of its excess alcohol to the manufacture of butyl rubber; while the latter wishes to utilize its considerable amounts of natural gas— aiming at the prevention of overlapping of efforts and over-production of special synthetic rubber types. Contact has already been made with these countries, and they seem ready to take the German suggestion under consideration.

Synthetic rubber problems were also aired by Otto A. Friedrich, general manager of the Phoenix concern and a director of the WdK. It was revealed that Perbunan production at present is not large enough to cover costs, and it cannot compete in price with similar foreign products. It was thus recommended that Perbunan be used for rubber goods for the home market to insure its continued production at Leverkusen and prevent the possibility that Germany may have to be entirely dependent on foreign supplies of this type of rubber. As to neoprene, development work for its production in Germany is progressing and is expected to be completed in 1-1½ years, it was stated.

The position of German rubber manufacturers now faced with sharper competition at home and abroad, was weakened, Friedrich pointed out, by the present taxation policy in Germany as well as by the fact that they had to pay higher prices than their opposites abroad for a series of raw materials. Thus certain chemicals were 50-100% higher than abroad; the American tire industry paid 30% less, and the English 20% less, for rayon than the German.

Chemische Werke Huls Reorganizes

On December 19, 1953, Chemische Werke Huls, G.m.b.H., was released from Allied control. The concern is the fourth member of the former powerful I. G. Farbenindustrie (now in liquidation) to be thus freed; the three others are Farbenfabriken Bayer A.G., Farbwerke Hoechst A.G., and Badische Anilin & Soda Fabrik, A.G.

Chemische Werke Huls was formed in 1938 with a capital of 30,000,000 marks, later increased to 120,000,000 marks, of which I. G. Farben held 74%, and Bergwerkgesellschaft Hibernia, 26%. Chemische Werke Huls was among the establishments seized by the Allies in November, 1945; later it was partly dismantled and subjected to various restraints as to production. In the beginning of 1951 the restrictions were eased, and the company began to expand production and improve plant facilities, an undertaking which cost 90,000,000 marks by the end of 1952. Output at present includes plastics, softeners, solvents, Buna, materials for synthetic fibers, and many other chemical products. The operation requires more than 10,000 workers—about 2,500 under the 1941 peak. Sales increased from 115,000,000 DM. in 1948 to 260,000,000 DM. in 1952; exports accounted for 30% of the total in the latter year. There was a further increase in sales, about 20%, in 1953, with exports representing 34% of the whole. Business was sufficiently favorable to permit paying a dividend for 1953.

The company has reorganized since its release from Allied control and is now an Aktiengesellschaft (joint stock company) to be known as Chemische Werke Huls A.G. Chairman of the supervising board is Dr. Richter. The board of directors of the new organization includes Professor Baumann, president; and Dr. Beckmann, Messrs. Gassberger and Husung, Dr. Kuhfuss, Mr. Roehder, and Dr. Zobel.

For a German Plastics Institute

It is now several years since the suggestion was made for the foundation of a German Plastics Institute to represent all sections of the plastics industry in which all sections would participate. Certain leaders of the industry immediately set about exploring ways and means, but met with relatively little encouragement. A marked change in attitude, however, was revealed

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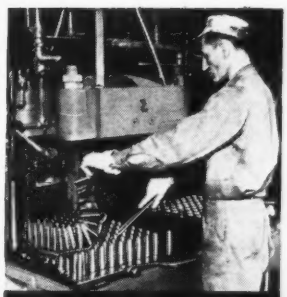
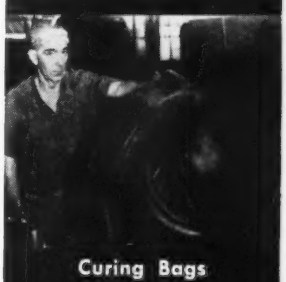


Deep Cavity Molds



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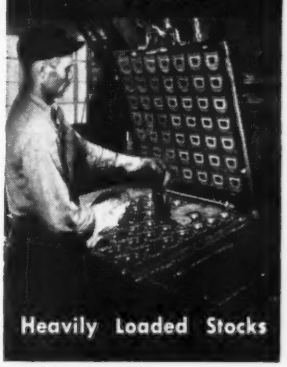

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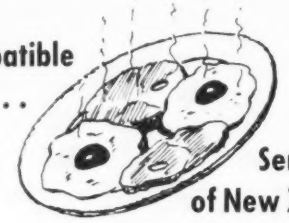

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at a special meeting of the General Association of Plastics Manufacturers, June 5, when reports on preliminary work and the eventual scope of the proposed organization and methods to be pursued were submitted. After a discussion of the reports the assembly unanimously resolved that the foundation of a German Plastics Institute is essential to maintain German competitive strength in the field of plastics and that the Institute, working in association with the Dortmund Technical Institute, as outlined in the reports, will serve the purpose aimed at. It was further unanimously agreed that the project should have full support, and that it was an essential task of the plastics associations to raise funds for the speedy establishment of the Institute.

Company Reports

Farbenfabriken Bayer recently started to manufacture silicone rubber. The company was already producing silicone resins and oils as well as water-soluble silicones for impregnation of paper and the like. In the development of these products Bayer has adapted American methods to the special requirements of European and particularly German markets. At present an installation is being erected at Leverkusen where the intermediates for silicones are to be produced so that before long the concern will be independent of imports of these materials.

The Degussa, Deutsche Gold- und Silber-Scheideanstalt, formerly Rossler, of Frankfurt a.M., which not long ago licensed Godfrey L. Cabot, Boston, Mass., U.S.A., to manufacture white reinforcing agents, particularly Aerosil, has now entered further licensing agreements with the American concern. The new contract, which is to run for ten years, permits Degussa to manufacture and sell both on the German and foreign markets carbon black produced according to the Cabot patents. A factory will be erected at Dortmund at a cost of 5,000,000-10,000-000 DM.

After eight years, Kolnische Gummifaden-Fabrik, Vormals Ferd. Kohlstadt & Co., Cologne, manufacturer of rubber thread, resumed payment of dividends, the 1952 report reveals. The company, which has a capital of 1,125,000 DM, distributed 6%. During 1952, sales in the home market could be maintained at the level of the preceding year, but exports were about a third lower so that the overall results for the year amounted to a reduction of 5½% in the value of sales. Business in the first third of 1953 was good, and orders on hand justify the expectation of a satisfactory year.

Deutsche Dunlop Gummi Compagnie A.G., Hanau a.M., reports net profits of 1,700,000 DM for 1952; a dividend of 8% was paid as well as a bonus of 4% to make up for the many past dividendless years. Net profit for 1951 had been 3,860,000 DM. During 1952, volume of tire sales was increased, and despite the fact that sales prices were lower—in some cases the reduction amounted to 20%—the total value was 10% higher than the year before. In the manufacture of tires, rayon continues to replace cotton, and in the year under review, more than 20% less cotton was used than in 1951 despite the fact that total consumption of fibers for tires increased by about 20%. Developments in other lines were also satisfactory; sales of Semtex flooring could be more than doubled. A separate company has been established, with a capital of 6,000,000 DM, to manufacture and sell Dunlopillo products; present manufacturing facilities for these goods will have to be expanded or a new building erected.

Phoenix Gummiwerke A.G., Hamburg-Harburg, reports that results for 1952 were satisfactory despite strongly fluctuating prices for raw materials and repeated reductions in the prices of finished goods. It was noted that while tire prices at the end of 1952 were only 20% higher than at the time of the currency reform five years ago, the price of natural rubber was 70%, and the cost of labor, 80% higher. Thanks in large part to the agreement with Firestone Tire & Rubber Co., Akron, O., U.S.A., modernization of plant and installations could be continued at a satisfactory rate during the year. Production could be largely increased, and the number of employes raised from 5,600 to almost 6,000. At the same time it was stressed that competition at home and abroad had become much more severe, and that there was a good deal of price-cutting so that the increase in profits was commensurate with the increase in sales. Net profits for the year came to 1,680,000 DM, against 1,370,000 DM, and a dividend of 6% was again declared on the share capital of 16,000,000 DM. The company proposes to increase this by 3,000,000 DM, and it is emphasized that this increase will involve no foreign participation; the entire issue is to be negotiated on the German market.

The per capita rubber consumption by Western Germany in 1952 worked out at 2.1 kilograms,[1] against 8.2 kilograms for the United States, 4.0 kilograms for the United Kingdom, and 2.9 kilograms for France.

The International Galalithgesellschaft A.G., Hamburg, has increased the production of Harlon, a polyvinylidene chloride product. The company is contemplating the production of polyester resin molding materials in the near future.

[1] One kilogram equals 2.2 pounds.

The versatility of vinyl dispersion (Plastisol) compounds lends itself to many wide and varied applications. The Watson-Standard laboratories can help you adapt these products to production and end uses.

Molding:

Watson-Standard Vinyl Plastisols and Rigidsols have been used with both slush molding and dip molding. Such items as doll and doll parts, toys, spark plug covers, electrical components, novelties, puppets, toilet valves, boats, light sockets and others are illustrations of this type of application.

Dipping:

Watson-Standard Vinyl Organosols and Plastisols have been applied by dipping. Varied end products include dishwasher baskets, dish racks and drainers, electrical wiring, gloves, and springs for the automotive and upholstery industries.

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Watson-Standard Vinyl Plastisols and Organosols may be spread coated. Coated textiles and paper are typical of this type of application.

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Special foundations of Watson-Standard Vinyl Organosols and Plastisols may be applied by spraying. Finishes for metal furniture, cabinets and blowers are representative uses.

Casting:

Since Watson-Standard Vinyl Plastisols are in liquid form and may be readily poured, they lend themselves to casting. Casting applications include films, sealants for automotive and refrigeration industries, ceramic pipe joint threads, and potting compounds.

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Watson-Standard Vinyl Plastisols may be formulated for troweling. This type of application lends itself to linings for tanks and sealants.

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FRANCE

Buna S from French Alcohol?

As was reported in these columns recently, the French Association of Alcohol Distillers has submitted to the Finance and Industry Ministries a proposal for an arrangement with the Chemische Werke Huls, Germany, whereby 500,000 hectoliters of surplus French alcohol would be supplied annually to the German concern at 24 francs a liter, for the production of Buna rubber, and France in return would receive annually 12,000 tons of Buna at the price of 210 francs per kilo (about 28 cents a pound). Of the total, it is calculated, France would retain 9,000 tons for home consumption, while reexporting the balance. It further seems that it has been suggested the agreement should run for 12, 17, or 25 years; mention has also been made of French participation to the extent of 3,000,000,000 francs, or 40%, in the estimated cost of a new synthetic rubber factory to be built at Huls and expected to produce 30,000 tons of Buna a year.

An agreement of this kind could put German Buna in a position to compete successfully on the world market and, hence, is calculated to tempt German interests. The Huls Werke has put the French proposal before the Ministry of Economic Affairs.

As to France, whatever the attitude of the authorities may be, the French rubber industry has a number of reasons for opposing the whole plan, to judge from an article by the Syndicat National du Caoutchouc.[1] The Syndicat begins by showing that by the plan France would in effect be handing the German synthetic rubber industry a subsidy of 3,800,000,000 francs—thus: the alcohol to be supplied to Germany at 24 francs a liter, would cost the Service des Alcohols an average of 100 francs a liter, at prevailing rates—giving a deficit of 76 francs on each liter supplied, representing on 500,000 hectoliters per annum, an annual loss to French economy and gain to Germany of 3,800,000,000 francs.

This amount added to the total cost of 9,000 tons of synthetic rubber (the amount retained for home use) at 210 francs a kilogram, that is, 1,890,000,000 francs, would bring the cost to France to 632 francs per kilogram (equivalent to about $0.80 per pound). And France would still have to find ways to export profitably the balance of 3,000 tons annually—or at least without loss.

Faced by strong competition from the United States, Britain, Germany, and Italy, the French rubber industry can only survive and develop if it constantly improves quality while reducing costs and therefore must, like its competitors, be free to choose its raw materials at world prices.

But, says the article, the present scheme takes no account of the position of the French rubber manufacturers and makes no provision for the case that new and cheaper and better rubbers may be developed while the contract is in force. Under the scheme, only butadiene based rubber would be produced (since the raw material is alcohol), and all other rubbers, particularly the Butyls and neoprenes, excluded.

But it is precisely the latter two types which are being used to an increasing degree in France—consumption has risen from 2,900 tons in 1950 to an estimated 6,200 tons in 1953 and they now constitute about 50% of French absorption of synthetic rubbers. On the other hand, absorption of standard GR-S has become stabilized at around 4,000 tons annually; with 2,500-3,000 tons of special types of GR-S, the total might be brought to 6,500 to 7,000 tons. But even so, France would be receiving from Germany considerably larger quantities of GR-S than she could absorb—a situation which in practice could lead to the barring of the establishment on French soil of a French factory to compete with German GR-S, for the latter would have to be absorbed first. Measures might even have to be introduced to force French manufacturers to employ German GR-S first, and thus the use of other synthetic rubbers by France would be hit.

[1] *Rev. gén. caoutchouc*, 31, 1, 4 (1954).

SWITZERLAND

New Vacuum Forming Machine

In the production of shaped objects from sheets and films of flexible and rigid plastics, the deep-drawing press and the blowing method have until recently been the most commonly used procedures. A newer method—deep-drawing under vacuum (vacuum molding), which has been developed in the United States, is also making its way in Europe. Interest in this process is expected to receive considerable stimulus from a new, automatic

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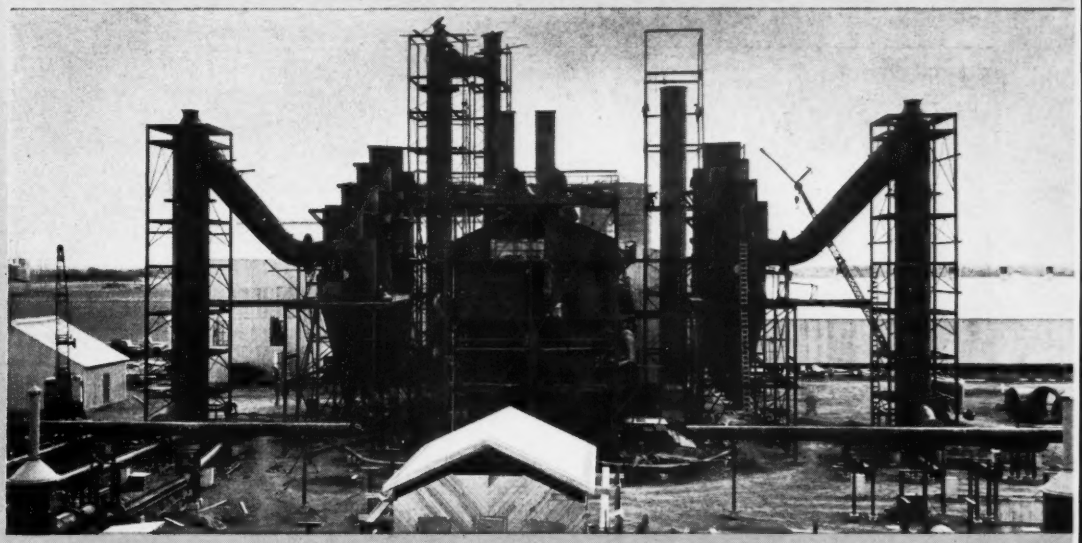

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The "Formvac," as it is called, is put out by the plastics development section of Hydro-Chemie A.G., Zurich, and can be used to shape and deep-draw hard and soft PVC, celluloid, cellulose acetate, acetobutyrate, ethyl cellulose, polystyrene, mixed polymers, polyethylene, methocrylate resins, polyamides. Sheets and films of any thickness can be treated, but preheating is recommended for very thick sheets or hygroscopic films, and a preheating oven or drying tunnel for this purpose can readily be connected to the machine since it is accessible from all sides.

The apparatus is designed to be operated at opposite ends; that is, it has two loading surfaces in each of which one or more molds—depending on the size—can be fixed; they can be pneumatically raised or lowered as required.

The infrared heating unit, which has an effective radiation area of 60 by 90 centimeters (about 24 by 36 inches), is claimed to insure absolutely uniform, electronically regulated heating over the entire forming surface at temperatures from 100 to 400° C. The heating unit is mounted on slide rails and can also be adjusted for height.

The device has a specially designed high efficiency vacuum pressure pump which maintains adequate vacuum and compressed air for continuous operation on both sides of the mold to a maximum drawing depth of about 350 millimeters (about 14 inches).

Instant deaeration gives sharply defined outlines, it is claimed; cooling and mold discharge are accelerated by compressed air. Air pistols at the sides of both working surfaces aid in cooling and in the discharge of especially complicated parts and in dusting off the molds. The machine is equipped at both ends with the necessary gages, registers, and regulators; it weighs 1,000 kilograms (2,200 pounds), is 270 centimeters long (eight feet), 125 centimeters (four feet) wide, and 131 centimeters (4¼ feet) high.

Molds may be made of wood, plaster, cement, light metals, or by the sprayed metal process. Articles of the most varied shapes and sizes and thicknesses can be produced, as luggage, convex surfaces for refrigerator doors, bowls, boxes, wrapping materials, grained imitation leathers, decorative relief designs, and all kinds of surface effects on materials for upholstery, table cloths, wall hangings, floor coverings, etc.

ITALY

New studies in vulcanization with the aid of the T-50 test were recently discussed by Dr. A. Chiesa.[1] Though T-50 has been in use about 20 years for checking vulcanization conditions, no attempt hitherto was made to find mathematical relations for the results. Dr. Chiesa shows that T-50 is of considerable value in studying complex and important problems, as, for instance, the determination of the vulcanization characteristics of a new compound both as regards the ingredients it contains and its thermal treatment. The T-50 test rapidly makes available quantitative data which serve in guiding the work and in rendering it easier and more conclusive and can do so better than any of the usual tests (dynamometric parameters, aging, and relaxation at elevated temperatures).

It has been established with a high degree of precision that the test obeys an energy law—the Arrhenius law—which relates the temperature and the reaction rate of a phenomenon by a parameter that depends on the activation energy of the phenomenon itself. It was clearly shown that except in the case of mixes having special vulcanization characteristics, the activation energy of a phenomenon is practically independent of the composition of the mix, thus suggesting that such energy is directly dependent on the nature of the polymer employed and on its vulcanization reactions with sulfur, but is independent of the chemical and physical factors which regulate the vulcanization reaction.

A scientific investigation of the physical significance of this fact with reference to the molecular structure of cross-linked high polymers was not within the scope of the present study, but an application of considerable practical value was developed from the fact that the activation energy is practically constant.

A simple correlation diagram, valid for most mixes, can be set up by means of which it is possible immediately to obtain equivalence coefficients for passing from one curing temperature to any other over the longest range of temperatures employed—that is, from 78 to 151° C. Thus the T-50 data for the particular temperature at which they are obtained can be separated and embodied in a more complete and comprehensive representation directly connected with the chemico-physical phenomena of vulcanization.

(*Continued on page 122*)

[1] *Ricerca e Sviluppo (Research & Development)*, Bulletin No. 1, Pirelli Co., Milan (Oct., 1953).

New Machinery

Schaefer 42-Inch Wide Cementer

Sheet Cementing Machine

A HEAVY-DUTY cementing machine has been developed by Schaefer Machine Co., Bridgeport, Conn., for use in cementing sheets of practically any material, including foam and sheet rubber and plastics, in thicknesses up to six inches.

Available in models with rollers 16, 22, 30, or 42 inches wide, the unit is claimed to be capable of applying latex, animal glue, resin glue, or rubber cement at controlled coating thicknesses. It is a rugged, portable machine that features a hydraulic tank-lift device for easy access and cleaning. The reported rate of operation of the 42-inch unit—10 seconds to cement on one side of a sheet measuring 40 by 96 inches—indicates the rapid functioning of the machine.

Pneumatic Displacement Pump

Air-Operated Ejectopump

EJECTOPUMP, a new compressed air-operated displacement pump that is pneumatic in action and contains no rotating or reciprocating parts, has been developed by Gresham & Craven, Ltd., of Great Britain. Distributed in this country by Ferro Corp., Cleveland, O., the pump is a self-priming unit that operates in a series of regular suction and discharge strokes. Abrasive slurries, latex and latex paints, inflammable solvents, and lubricating oils can be handled by the pump, according to the distributor.

Constructed without glands or bearings, the Ejectopump consists essentially of a cylindrical casing, a float, two return valves, and a header mounted above the casing. The header houses the pneumatic valves and an air-operated ejector which is in operation during the suction stroke only. The rate of air admission to the casing during the delivery stroke is adjustable, and output can be controlled to give any desired pumping rate. As a result of the design, neither aeration nor churning action is possible, according to the manufacturer.

When operated with compressed air at 30-50 psi., the standard unit will handle discharge heads up to 50 feet. Normal maximum suction is 10 feet, although 20-foot intakes can be obtained with a special ejector. Three styles of Ejectopumps for specific types of applications are available in sizes from 1½-6 inches.

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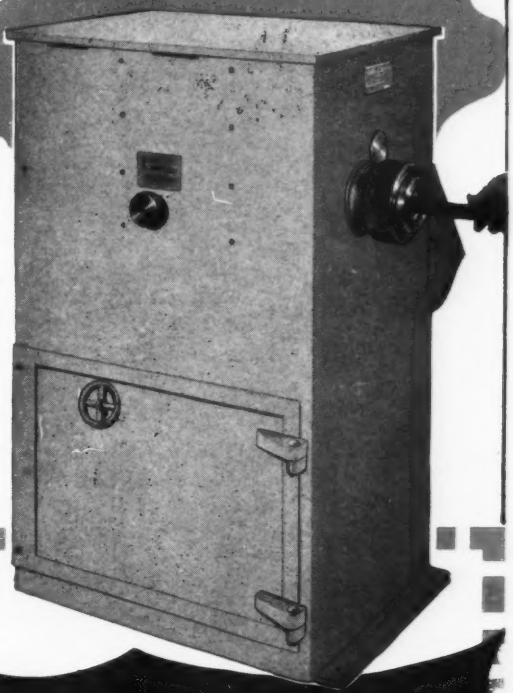

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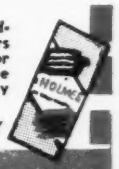

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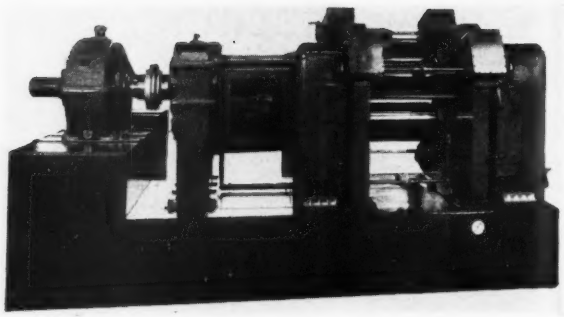
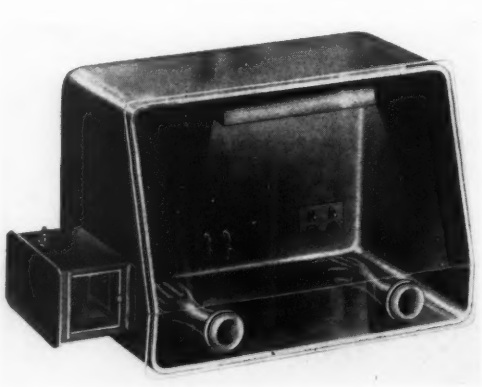


Laboratory Z-Calender with Crossed-Axis Feature

Laboratory Z-Type Calender

A 10½- by 24-inch, four-roll, inclined Z-type calender has been developed by Adamson United Co., 730 Carroll St., Akron 4, O., for laboratory use with rubber, plastics, and flooring materials. Feature of the new machine is the use of crossed-axis equipment for two of the rolls, permitting laboratory evaluation of the roll-crossing feature in compensating for roll deflection.

Equipped with hardened forged-steel rolls and manually operated adjusting screws, the calender contains a circulating oil lubrication system and either sleeve or anti-friction bearings. Drive is by means of a separate pinion-gear stand, allowing rolls to be individually driven by universal joints or wobblers.



C. A. Hood of Glass-Fiber Plastic Material

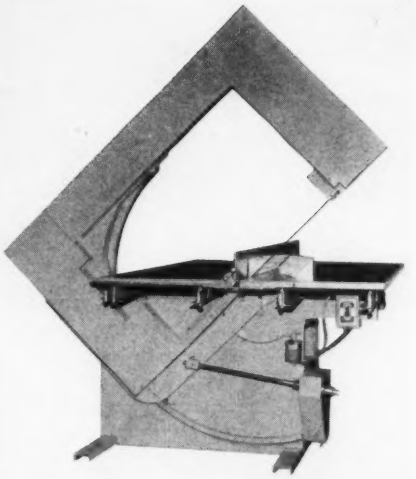
Controlled Atmosphere Hood

A LOW-COST, lightweight, portable controlled atmosphere hood, designed for creating a completely dry, sterile, inert, and dust free chamber, is being manufactured of glass-fiber reinforced plastic by P. M. Lennard Co., Inc., Brooklyn, N. Y. The standard model, 36 by 20 by 24 inches, can be adapted to assembly-line production applications.

In operation, a filter system that employs vacuum or pump is used to purify the contained atmosphere from dust, bacteria, and/or moisture. Hands or objects can be inserted and removed without loss of internal pressure or control conditions. Utilization of this new device in the radioactive field is suggested because high energy alpha and beta particles and low energy (100 millicuries) gamma photons can be controlled. This control can be exercised by inserting any required thickness of lead sheeting between the laminated layers of the hood.

Phillips Rotary Joints

THE availability of the new ball-and-socket type of Phillips rotary joints for use in introducing liquid or steam into revolving drums has been announced by Key Co., East St. Louis, Ill. Supplied in two series, the Thru-Flo style, for drums having two outlets, and the Syphon style, for units requiring both inlet and outlet in the same attachment, the new joints are made in pipe sizes from ¼-3 inches of almost any metal desired.

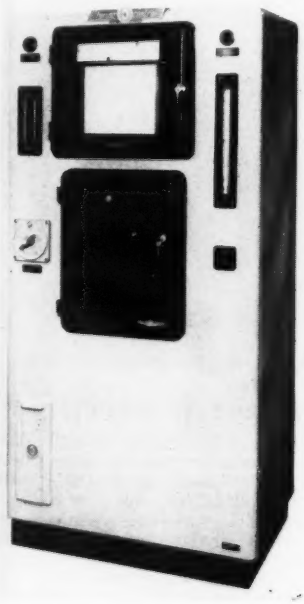


Foam Rubber Band Machine Cutting at 45 Degrees.

Foam Rubber Band Saw

THE availability of a foam rubber band machine, specially designed for cutting bonded foam, fibrous glass, rubberized hair, cellulose sponge, resin-bonded fiber, and similar materials, has been announced by Frank Edge Mfg. Co., Grand Rapids, Mich.

Constructed with a special guide and a blade that requires no resharpening, the new machine can accommodate material up to 80 by 60 by 30 inches on either side of the blade. The cutting table (wood) is mounted on ball-bearing rollers to permit travel of 78 inches. The power-operated automatic tilting cutting blade assembly enables cuts up to 45 degrees from the vertical to be made. Powered by a 2-hp., 1,750 rpm. motor through a V-belt drive, the blade travels at approximately 4,000 feet a minute over four 12-inch rubber tired aluminum wheels. Strips as narrow as ¼-inch can be cut smoothly, according to the manufacturer.



Viking Type SU H_2S Detector

Hydrogen Sulfide Detector

AN H_2S detector, designed to provide continuous and automatic detection of the gas, to record its findings in quantitative measurements, and to maintain this record in chart form, has been developed by Viking Instruments, Inc., East Haddam, Conn. Designed as the Type SU hydrogen sulfide detector, the new machine can be employed to determine the parts-per-million concentration of the gas in process streams or in the atmosphere and can be furnished with alarms or other warning devices.

A fixed rate of gas enters the sample chamber, and, depending on the length of exposure of the gas to a test strip and on the concentration, a stain is produced on the strip. The density of the stain is electronically measured and recorded on a chart which presents the reading in H_2S concentration. Fresh portions of strips are introduced into the sample chamber at predetermined intervals. In this way, average as well as extreme conditions in the concentration of the gas are continuously available on the chart.

The detector can be arranged to provide full scale ranges from 200 parts per million (max.) to 0.05-part per million (min.).

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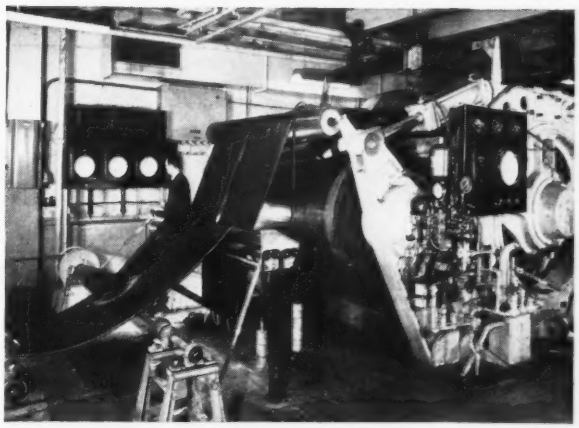

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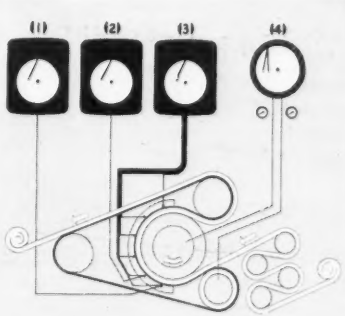

Instruments (1) and (2) are Foxboro Dynalog Input Controllers on Chromalox radiant heaters. (3) is a Multi-Record Dynalog Temperature Recorder which provides continuous records of the critical curing zones. (4) is a Foxboro Dual Controller which maintains constant temperature within the steam-heated rolls.

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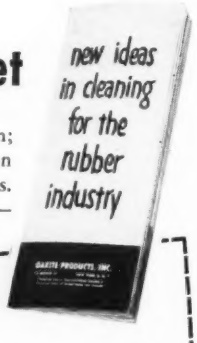

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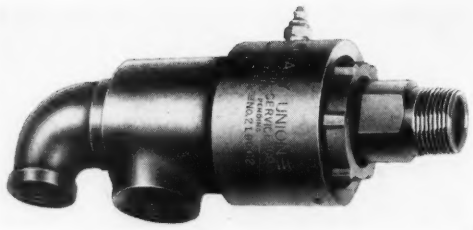


New Lock Nut-Type Rotary Union

Field Repairable Rotary Unions

BOTH one-way and syphon-type rotary unions for introducing steam or liquids into rotating equipment are now available in models that can be repaired without returning them to the manufacturer. Produced by Perfecting Service Co., Charlotte, N. C., the new ball-bearing units are similar to the unions formerly marketed by the company except for the field repairable feature. Such repair can be made standard maintenance tools.

In addition, conversion of previous models to the new design is possible by means of a cartridge unit; the resulting units also are capable of field repair, according to the company.

The new unions have been made possible by the development of a lock nut which replaces the former factory sealed lock ring and allows for easy dismantling. Units sized from ¼-2 inches and designed for pressures up to 250 psi. are available.

SR-4 Calibration Kit with Indicator at Right

Calibration Instruments for Testers

UNIVERSAL electrical calibrating instruments for calibrating and proving testing machines and other measuring equipment under both tension and compression loads are available from Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. Contained in Calibration Kit SR-4, the units employ precision-type load cells which incorporate bonded resistance wire strain gages to perform their function.

The portable, battery-operated kit consists of an indicator and a set of calibration load cells which are available in 11 capacities ranging from 60-120,000 pounds for loads in tension and/or compression, and in four capacities from 24,000-240,000 pounds for compression loads only. Supplied with a calibration report by the National Bureau of Standards, the instruments have a guaranteed accuracy with this report of ± 0.1% of applied load over the range above one-tenth of full indicator scale. A correction curve supplements the NBS report to provide an adjusted reading, converted to the true load by a simple multiplication operation.

The SR-4 equipment reportedly meets specifications of ASTM E74-50T, Tentative Methods for Verification of Calibration De-

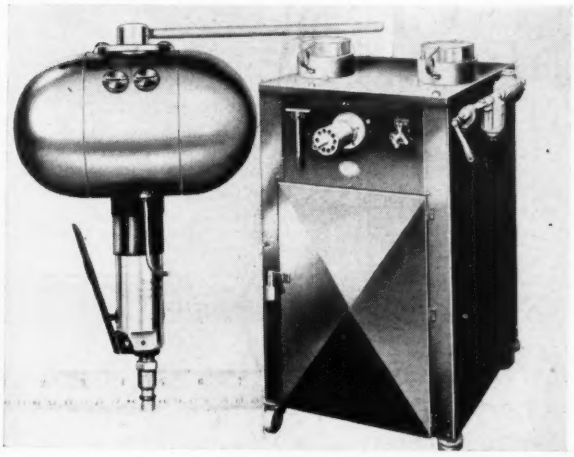
vices for Verifying Testing Machines. The new indicator, a refinement of the standard Baldwin SR-4 portable strain indicator, is the manually null-balanced type having a scale reading from 0-60,000 units (5,000 units for each of the 12 segments).

Redesigned Process Timer — Type TSA-18

A NEW line of process timers for providing accurate, adjustable time-delay opening and closing of electric contacts on such equipment as hydraulic presses, tire molds, heat-treating ovens, mixing machines, conveyors, etc., has been announced by General Electric Co., Schenectady, N. Y. Use of the new timers, designated Type TSA-18, saves workmen's time, reduces waste material, and improves manufactured products in processes where time is a factor, according to the company.

TSA-18 Process Timer

Available in single- and two-circuit models, the units can be used in any combination to control three, four, 10, or more circuits. A power supply of 60, 50, or 25 cycles, with a contact rating of 10 amperes at 120 volts or five amperes at 240 volts, is required for operation. Features of the redesigned timers include: extra-heavy nylon gears; overall construction of almost 100% pure zinc alloys; and a dust-resistant cover.



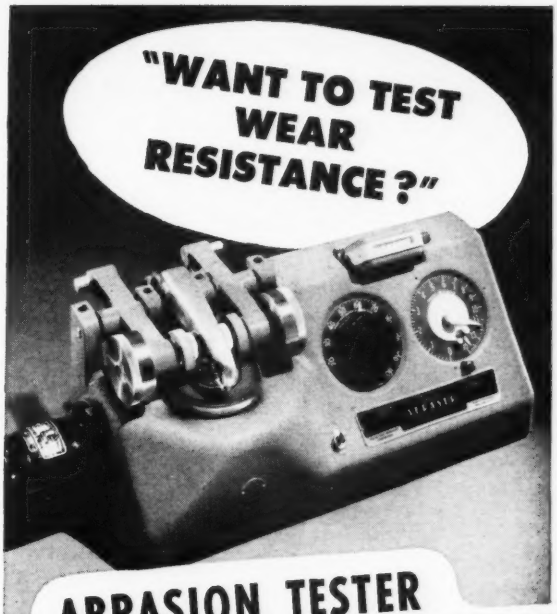
Pro-Seal Hand Filleting Gun *(Left)* and Master Mixer *(Right)*

Proportioning and Mixing Equipment for Thiokol

THE Pro-Seal Master Mixer and the Pro-Seal Hand Filleting Gun are two new pieces of equipment manufactured by Coast Pro-Seal & Mfg. Co., Los Angeles, Calif., for use in properly mixing and applying "equal-part" Thiokol liquid polymer compounds. The polymers, supplied as separate components by Thiokol Chemical Corp., are solventless liquids that require accurate proportioning and homogeneous mixing with an oxidizing curing agent in order that their optimum sealing properties be realized.

Both the semi-stationary mixer and the portable gun automatically perform these operations after gear pumps convey and meter the material components into the respective mixing heads of the machines. The resulting dispersion is obtained at a substantial labor saving, according to the manufacturer.

Application of the polymer from the mixer's chamber, capacity of which is two gallons (or about 20 pounds), is by detachable tubing. Capacity of the gun, which is intended for smaller operations, is one pound. At present the Pro-Seal equipment is being used primarily in the aircraft industry for sealing and filleting, although its use in other fields is expected.



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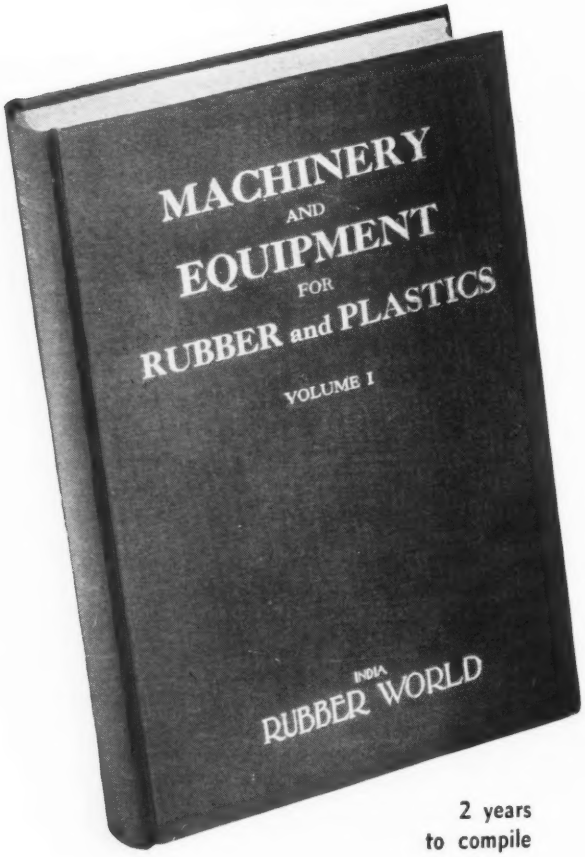

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The urgent need and value of this 804 page book will be self-evident to all engineering, processing, purchasing and management personnel, especially to those men who have been confronted in the past with the problem of gathering this frequently needed and vital information from varied and widely-scattered sources.

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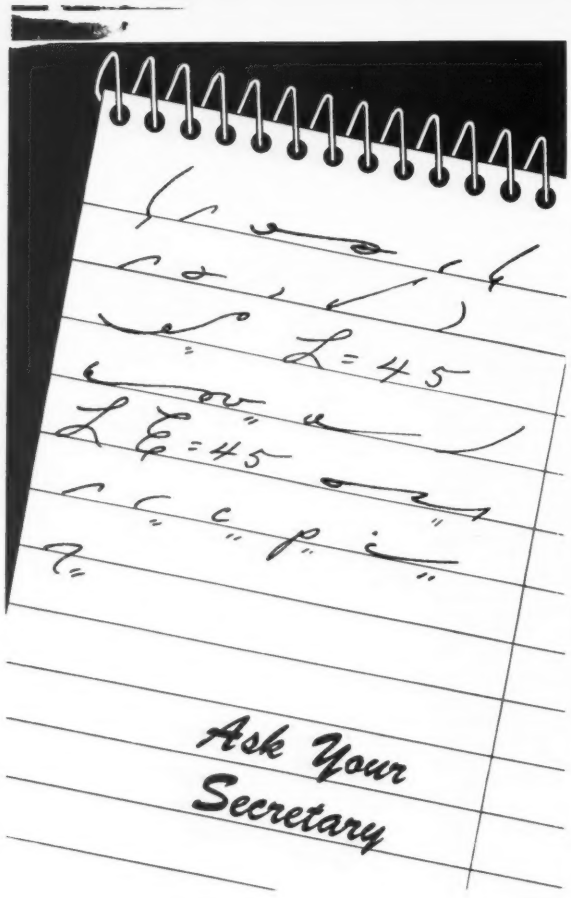

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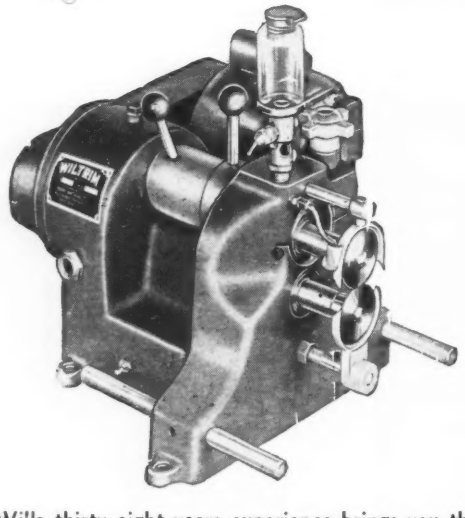

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New Materials

Room Temperature Vulcanizing Silastic

THE development of a silicone rubber which reportedly vulcanizes at room temperature and which develops temperature stability, water repellency, and characteristic chemical-resistant properties within 24 hours after application has been announced by Dow Corning Corp., Midland, Mich. RTV Silastic, as the new material is called, does not require heat, pressure, or full exposure to air in order to cure sections up to ⅛-inch thick, according to the company. Sections up to one-inch thick may be cured under pressures up to 50 psi., however; and curing time can be substantially reduced if heat is applied after the rubber has set.

The product is available in several solvent-free consistencies, ranging from fluid enough to flow under its own weight to heavy enough to require milling. The material is shipped and stored as two separate catalyst-containing components, mixing of which in equal parts by weight results in a reaction that forms the useful material.

Dow claims that the Silastic will set up within four hours after application, cure within 24 hours, and develop its optimum properties within four to seven days. The addition of xylene or a comparable solvent to extend the working time by as long as three weeks only extends the curing period to two days and the time to develop optimum properties to six or seven days.

Typical properties given for a ⅛-inch section of RTV Silastic include: Shore A durometer reading, 15-30; tensile strength, 130-500 psi.; elongation, 300-600%; moisture absorption after seven days at 70° F., 1-2%; dielectric strength, 350-500 volts per mil; and dielectric constant, 3.2-3.4 at 100 cycles.

Pittsburgh PX-800 Epoxy — New Plasticizer

THE Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., has announced the availability of a new plasticizer, Pittsburgh PX-800 Epoxy, whose use in vinyl formulations is said to result in improved stability and permanence for the final product.

Also recommended for incorporation into synthetic rubbers, the new material is described as a highly compatible polymeric type of compound. Its use in plastisols, organisols, and other vinyl formulations that can be molded, extruded, or calendered provides products which exhibit low volatility and excellent resistance to extraction by oils, gasoline, and soap solutions. Its function in final products as both a heat and light stabilizing agent reportedly makes possible a reduction in the amount of metallic stabilizer ordinarily required with other plasticizers.

Polyethylene Overprint Varnish—ARCCO C 602

A VARNISH for use in coating printed polyethylene material has been developed by American Resinous Chemicals Corp., Peabody, Mass. Designated ARCCO C 602, the new material protects inked surfaces by providing a surface film that has excellent abrasion resistance, good flexibility, and is non-blocking, according to the manufacturer.

ARCCO C 602 may be applied by regular aniline coating equipment when mixed with half its weight of a special thinner. Physical properties reported for the varnish include: viscosity, 46 centipoises; solids content, 40%; and specific gravity, 0.821 (6.8 pounds per gallon). The manufacturer reports that the material is being widely used in commercial quantities by a number of converters.

Emulsifier Intermediate — IPAE

ISOPROPYLAMINOETHANOLS, described as a balanced blend of isopropylmonoethanolamine and isopropyldiethanolamine which functions as an efficient emulsifier intermediate, is available in commercial quantities from Sharples Chemicals, Inc., 1100 Widener Bldg., Philadelphia 7, Pa. Suggested for use in synthetic rubber latex production and coating, IPAE produces soaps that exhibit high emulsifying and dispersing power at low concentrations.

The new material is represented as having the following physical properties: average molecular weight, 116; boiling range, 110-265° C.; weight, 7.5 pounds per gallon; color, straw; odor, mild amine; and flash point (open cup), 155° F.

Delay Accelerator — NOBS[1] Special

A RUBBER chemical, NOBS Special Accelerator, that is described as extending the safe processing period of scorchy stocks by as much as 10 minutes, has been introduced by American Cyanamid Co., Bound Brook, N. J. Identified as n-oxydiethylene benzothiazole-2-sulfenamide, the new material is designed for use with high pH reinforcing carbon blacks in tire tread compounds and molded products. Its action in prolonging the processing period allows mold flow in the first few minutes of the cure cycle and reduces surface defects and flow cracks, according to the company.

Supplied as tan, dustless flakes, NOBS Special has a specific gravity of 1.37 and a low melting point (90° C.) that reportedly insures good dispersion at normal mixing temperatures. It is said to have excellent stability when stored at normal warehouse temperatures.

The quantities recommended by the company for use in tread compounds reinforced with furnace black are: 0.5-0.7% NOBS Special for natural rubber stock having a sulfur content of 1.75-2.25%; and 0.8-1.0% NOBS Special for GR-S stocks having a sulfur content of 1.75-2.00%. Additional activation of the stock is necessary, however, if faster cures are required, if the stock is oil-extended GR-S, or if no furnace black is employed. In the first two cases the incorporation of small quantities (0.1-0.15%) of diphenylguanidine should provide such activation; in the last case, basic materials such as guanidines, thiuram monosulfides, or lime should suffice.

[1] Trade mark.

Primary Plasticizer — Ohopex Q-10

OHOPEX Q-10, a mixture of octyl, fatty-phthalic acid esters, is available from Ohio-Apex Division, Food Machinery & Chemical Corp., Nitro, W. Va., for use as a primary plasticizer for most resins including vinyls, extruding and calendering compounds, plastisols and organisols, and synthetic rubber. Incorporated into these substances, the new material is said to impart all the excellent properties of di-octyl phthalate (DOP) plus better ultra-violet light stability, improved low-temperature flexibility, and a lower order of migration. The manufacturer also reports that the product will be less costly than DOP.

Ohopex Q-10 is represented as having the following specifications and properties: specific gravity, 0.952 (7.93 pounds per gallon); moisture content, 0.1% maximum; color, A.P.H.A. Pt-Co Max. No. 500; odor, mild (octyl type); acidity, 0.2% (as acetic acid); boiling range, 215-235° C (@ 4 mm. Hg); flash point, 224° C.; viscosity, 41 centipoises (@ 20° C.); and solubility, soluble in most organic liquids.

Thickening Agent — Carbopol 934

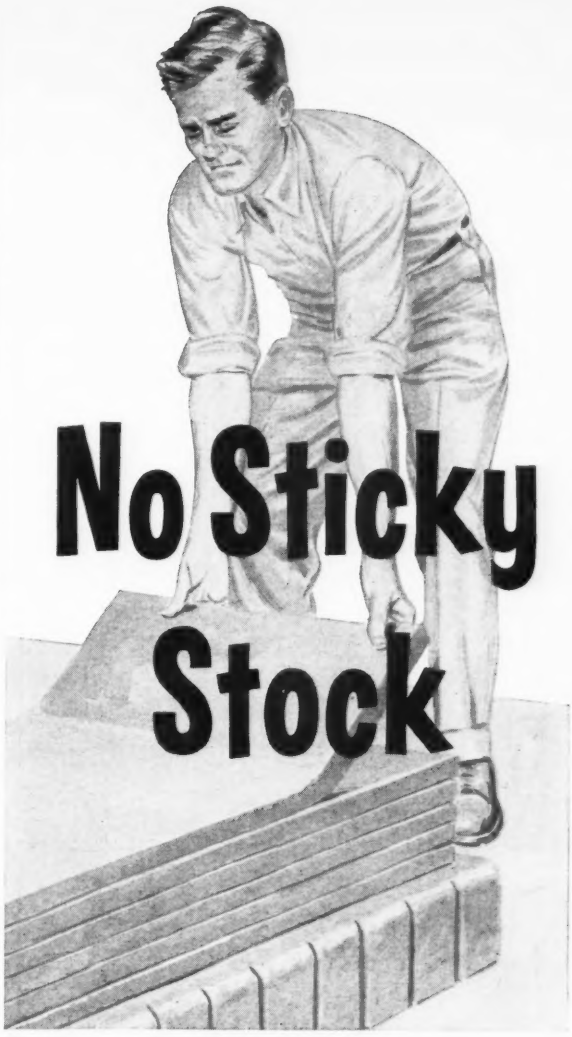
A NEW synthetic gum, called Good-rite Carbopol 934, has been introduced by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, O., for use as a thickening agent, suspending agent, and anti-caking agent for such water-containing products as latex and textile chemicals. The company claims that 1% of this material, described as a hydrophilic colloid, will transform water into a clear stable gel having a viscosity of about 30,000 centipoises when neutralized.

Supplied as a white, free-flowing powder which readily dissolves in water, the material forms viscous solutions having a low pH value. The viscosity of such solutions, variable between 10,000 and 70,000 centipoises, depending upon the addition of from ½-3% of Carbopol 934, can be maintained over a wide pH range, according to Goodrich. The thickening agent does not hydrolyze and is not affected by bacteria or fungi, and its solutions are relatively unaffected by aging and temperature changes, it is further claimed.

Styrene-Rubber Alloy—Ampalloy

AMPALLOY, represented by the manufacturer as a styrene-rubber alloy, is being produced by American Molding Powder & Chemical Corp., Brooklyn, N. Y., for use in molding operations. The new material is described as a high-impact styrene concentrate which, when compounded in certain percentages with general-purpose styrene, will produce an impact resistant molding compound.

Supplied in its natural color, Ampalloy can be colored by extrusion or milling, but is not recommended for dry coloring.



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Vinyl Stabilizer D-22

DIBUTYL tin dilaurate, a clear pale-yellow liquid, is available from Carbide & Carbon Chemicals Co., New York, N. Y., for use as a stabilizer for chlorine-bearing resins. Especially recommended by the company for use in clear vinyl products, the new material provides the plastic with superior ultra-violet light aging characteristics and retards darkening of the resin during exposure to the extremely high temperatures of calendering, extruding, and molding operations.

In calendered sheeting and film, the stabilizing reportedly enhances the heat-sealing properties of the plastic, as well as provides effective heat and light stability, when added in concentrations of 2% by weight. In addition, the new material can be easily incorporated into dry blended compounds for extrusion operations, and in organosols and plastisols for applications such as industrial coatings, slush molding, etc.

Specifications given for D-22 include: specific gravity, 1.066 (8.87 pounds per gallon); flash point (open cup method), 440° F.; tin content, 18-19.2% by weight; and maximum chloride content, 0.5% by weight. The stabilizer must be used with caution, however, owing to its toxicological properties.

Polyisobutylene B 150 and B 200

THE availability of polyisobutylene with an average molecular weight of 150,000 (B 150) and with an average molecular weight of 200,000 (B 200) has been announced by Nova Chemical Corp., 147-53 Waverly Place, New York 14, N. Y. These two grades are almost colorless in appearance and slightly tacky. Tensile of the B 150 is about 600 psi., and of the B 200, about 860 psi. Elongation is about 1000% for each grade. Specific gravity is 0.93, and elasticity is retained to —50° C. (—58° F.). Physical properties are retained to 100° C. (212° F.).

Used as an extender and tackifier with natural and synthetic rubbers, B 150 and B 200 provide improved resistance to aging and chemicals and also provide products with reduced odor and taste characteristics. Excellent electrical properties and stability against water make polyisobutylene valuable to the wire and cable industry.

Detailed technical information on these grades and others of lower molecular weight may be obtained from the company.

Vinyl Pigments

"VINYLIZED" colors, a complete line of 19 pigments in the form of dry, free-flowing, dustless powders, have been developed by Claremont Pigment Dispersion Corp., Brooklyn, N. Y., for use in extruded and calendered vinyl products. Said to combine the advantages of color chips with those of flushed colors, the new material is recommended for masterbatch incorporation in products in quantities up to 2% (for ¼-inch thick extrusions).

As much as 25% reduction in the down time required for periodic cleanout of charred compounds is claimed for continuous-run operations as a result of using these colors. Uniform and rapid dissemination of the color throughout the compound and a lessening of the degrading effects of heat exposure on resin and pigments are also realized, according to the manufacturer.

Laminating Adhesive — Insulam

A SELF-EXTINGUISHING fire-resistant laminating adhesive for use in bonding glass fiber to sheet metal, aluminum foil, vinyl film, and other non-porous surfaces has been announced by Paisley Products, Inc., New York, N. Y. Called Insulam, the material is represented as being a synthetic rubber-like resin emulsion and as functioning in two capacities. First, because of its quick "wet-tack," it provides suction to hold assemblies together until dry; and second, when dry, it becomes a water-resistant film that will not support combustion and will withstand continuous heats of 375° F. without delamination of the assembly.

The adhesive is reported to be translucent with a light-tan color and permanently flexible when dry. It can be supplied in 1-55-gallon containers; weight of each gallon is 9.6 pounds.

"Witco Dioctyl Phthalate (DOP)." Technical Service Bulletin E-6. Witco Chemical Co., 260 Madison Ave., New York 16, N. Y. 2 pages. The properties and uses of di-2-ethylhexyl phthalate as a primary plasticizer for vinyl resins are described in this bulletin.

New Goods

Close-Up View of Ribbed "Foot-Ease" Matting

Sponge Rubber Floor Matting

UNITED STATES RUBBER CO., Rockefeller Center, New York 20, N. Y., has announced the development of "Floor-Ease," a two-layer rubber matting designed to cushion the effects of concrete, tile, and similar floors on the feet of workers who must stand in their jobs. The matting consists of a layer of sponge rubber protected with a tough rubber cover and is available in both ribbed and pyramidic surface patterns. The finished product is sold in 25-foot lengths which measure 36 inches wide.

The "Foot-Ease" matting can be used in most places except on wet or oily surfaces. For those locations, the company is currently attempting to develop an oil-resistant rubber matting of the same quality.

Spike Resistant Matting

Another new development in the flooring field by U. S. Rubber is a spike resistant matting for clubhouses and caddy shops. Compounded of natural and synthetic rubber, the new product is reported to give four to five times as much wear as conventional matting.

The product is available in five colors and black in thicknesses of ¼- and ⅜-inch, widths up to 84 inches, and lengths up to 16 feet. Four different surface patterns, smooth, pyramid, corrugated, and cloth impression, are produced.

"Slipper" Finish for Wire

TYPE TW electrical wire, as produced by Anaconda Wire & Cable Co., New York, N. Y., is now being supplied to electrical contractors with a special "slipper compound" built into the surface of the cable covering to facilitate pulling the wire over beams and other structural members of buildings. The compound, in addition to providing a finish which reduces friction slippage, reportedly results in a surface that will not deteriorate with age or be rendered useless by oils. Flame resistant and non-flammable, the new type TW wire is said to have "long life," higher tensile strength of the conductors, and minimum porosity in insulation. Its low-temperature flexibility and heat-aging resistance also recommend it for use in the construction industries.

Non-Metallic Sheathed Cable

Another cable, also designed to aid electricians in pulling cable through joists, is Anaconda's new non-metallic-sheathed Silver Dutrax. Tests reported by the company have indicated that only half the force usually necessary to pull conventional cables is required with the new product as a result of a special finish. Containing twin conductors, Silver Dutrax Type NM will have no appreciable stickiness after storage for three days at 170° F. and will function satisfactorily at 0° F. after three days' exposure

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Patapar 55-24T — Less flexible. Recommended where rigidity in the backing material is desired.

Patapar 35-22T — Lighter in weight than the other types. Recommended where unusual strength is not required.

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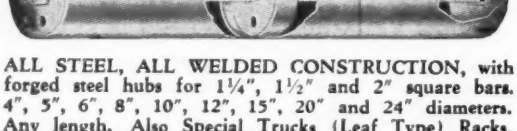

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to temperatures from 0 to —25° F. In addition, the cable subjected to the low-temperature tests did not mar wall surfaces, nor did the finish peel or flake in use, according to the manufacturer.

Truck Tire with Claws

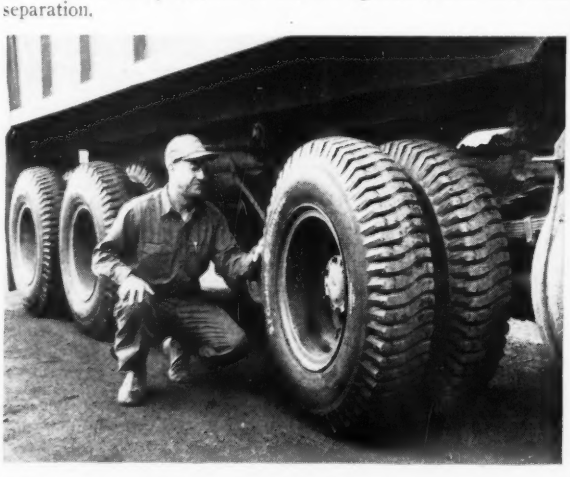
Wire Grip Express Tire

A HEAVY-DUTY express truck tire with more than 5,000 steel claws in the tread has been announced by The B. F. Goodrich Co., Akron, O., for use on slick surfaces. Approximately 80 claws per inch of tread width are contained in the product, with the claws arranged in a zig-zag pattern for improved traction. The steel wire used in this capacity is said to bind itself into the four outer tread ribs during the molding process and has a life expectancy slightly shorter than that of the original tread. The cord body of the tire can be recapped with a new wire-type tread or with tread of the standard type. Called the Wire Grip Heavy-Duty Express Tire, the new product is available in three sizes, 8.25-20, 10.00-20, and 10.00-22.

Super-Express Truck Tire

A new premium truck tire, reported to have up to 46% thicker tread than that of a regular tire, also is being marketed by Goodrich. Called Super-Express, the tire is produced in eight sizes, from 8.25-20 10-ply to 11.00-22 12-ply, for use on all truck wheels.

In addition to the thicker tread, the new product features a tread pattern with a wide center rib; an open shoulder design for easy dissipation of heat; and the use of Goodrich's nylon shock shield for protection of the tire against bruises and tread separation.

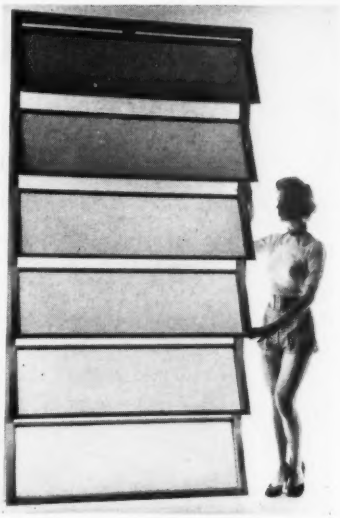


Trailer Equipped with Goodrich All-Purpose Tires

All-Purpose Truck Tire

The All-Purpose truck tire, designed for those trucks which operate primarily on the highway, but with some short-distance off-the-highway travel, also has been developed by Goodrich. Available with a nylon or rayon cord body, the new product features massive cleats, V-shaped tread grooves between lugs, deep treads, a center wear bar, and buttons on alternate cleats. A nylon shock shield, plus an extra shock shield under the tread, is built into the tire for protection from bruise breaks.

Translucent Polyester Panels



Plastic Panels Showing Various Degrees of Light Transmission

"GRADATION TROPIGLAS," a series of strong and colorful translucent plastic panels designed for use in the construction of buildings, is being made by Russell Reinforced Plastics Corp., Lindenhurst, N. Y. Fabricated of Vibrin polyester resin made by Naugatuck Chemical Division, United States Rubber Co., and Ferro fibrous glass, made by Ferro Corp., the units are available in four pastel colors and white, each color having six degrees of density that provide a light transmission range of 10-60%.

The new panels, capable of being cut, nailed, riveted, etc., are recommended for many applications from patio roofs to walls and windows. Pigments are so dispersed that all panels in any one color series will convey the same degree of color intensity to the viewer when light is being transmitted, it is further claimed. In addition, close control of the densifying agent and the pigment permit the same amount of light to pass through panels of 1/16-, 3/32-, or 1/8-inch thickness. Two standard sizes, four by eight feet and four by nine feet, in these three thicknesses are available.

Corrugated Rubber Matting

DURABLE, long-wearing, non-skid corrugated rubber matting, manufactured in cocoa brown, ebony black, and burgundy, has been introduced by Goodyear Tire & Rubber Co., Akron, O. Designed for use in clubs, stores, hospitals, and similar locations, the new product claims four times the abrasion resistance of previous types of matting.

This new matting is available in all-rubber construction in 1/8-inch thickness, or with cloth reinforcement in both 1/8- and 3/16-inch gages. Both constructions can be supplied in full or half-roll lengths in standard widths from 24-72 inches.

NeoFloor Surface Coating

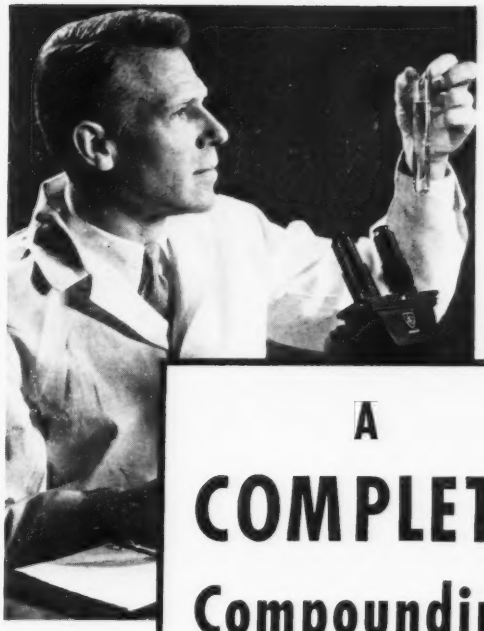
SAFETY and maintenance problems arising from the presence of oils, greases, and chemicals on concrete, wood, and metal floors in plants can be eliminated, according to Pennsylvania Salt Mfg. Co., Philadelphia, Pa., by applying to the surface a coating of NeoFloor. A grit-like material anchored in a matrix of resilient neoprene, the new product is bonded to the floor with an adhesive primer. Either brush or roller may be used to apply the quick-drying liquid primer and coating.

Besides being resistant to abrasion, skidding, and heat-aging, NeoFloors are claimed to be capable of withstanding the corrosive effects of acids, alkalies, detergents, and solvents at temperatures up to 220° F.

Chemical Cartridge Respirator

A RESPIRATOR which protects the wearer against both toxic dusts and organic vapors is being marketed by Mine Safety Appliances Co., Pittsburgh, Pa. Called the Comfo Chemical Cartridge Respirator, the unit consists of two replaceable cartridges and an exhalation port attached to a mask that fits over nose and mouth. Atmospheres containing up to 0.1% organic vapors by volume can be inhabited in safety when this device is being used.

(Continued on page 122)



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Editor's Book Table

BOOK REVIEWS

"Handbook of Probability and Statistics with Tables." Richard Stevens Burington and Donald Curtis May. Handbook Publishers, Inc., Sandusky, O. Cloth, 5¼ by 7¾ inches. 340 pages. Price $4.50.

One approach to reviewing any book is to determine the aims of the authors and appraise their success in achieving those aims. Another approach is to determine the value of the book for use in a given field.

The authors state that their aim is to present "a convenient summary of theory, working rules and tabular material useful in the practical problems in probability and statistics." They have been extremely successful in presenting a copious tabulation of formulae and their use. There is little to criticize in the formulae presented.

The reader without a broad statistical background should hardly expect to find adequate information here, however, to apply the "theory, working rules and tabular material" to his particular problems. Also, there is no extensive presentation of material that can be used as a refresher in methodology of application.

The industrial user will be no exception. He will not—and perhaps is not expected to—find here a ready reference to guide him in selecting formulae and techniques. This is particularly true in those phases of statistical methodology of greatest use to him: namely, analysis of variance, sampling acceptance plans, and quality control. Eleven pages are devoted to the first subject, 12 to the second, and seven to the third.

Notable omissions are material on propagation of error and on testing homogeneity of variance in several groups.

J. D. HEIDE

"Foams: Theory and Industrial Applications." J. J. Bikerman, in collaboration with J. M. Perri, R. B. Booth, and C. C. Currie. Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. Cloth, 6 by 9 inches, 353 pages. Price, $10.

This book offers an up-to-date treatment of the physical chemistry of foams and their industrial uses, as well as a critical review of the literature on this subject. With its extensive bibliographies and wide scope of working information, the book should be a valuable reference to physical and colloid chemists, patent searchers, and other technologists in the soap, petroleum, rubber, plastics, paint, and other industries where foams, their application or destruction, are of importance.

The text comprises 15 chapters covering the following topics: formation and structure of foams; methods of measuring foaminess; results of foaming measurements; foam drainage; mechanical properties of foams; optical properties of foams; electrical properties; radius of molecular action, and black spots; theory of foams; separation by foam; three-phase foams; fire-fighting foams; froth flotation; miscellaneous uses of foam; and chemical anti-foaming agents. Comprehensive author and subject indices are appended.

NEW PUBLICATIONS

"Blaw-Knox Quick-Opening Doors for Pressure Vessels." Bulletin 2435. Blaw-Knox Co., Pittsburgh, Pa. 8 pages. The advantages to be gained from the use of the company's quick-opening doors are expounded in this illustrated publication.

"Bakelite Polyethylene." Folder GA. Bakelite Co., New York, N. Y. 8 pages. Information about molding, extruding, and other ways of using polyethylene, as well as the properties of the resins, are presented in this folder.

"Scott Testers' ACCR-O-METER." Instrumentation Data Sheet 10.0-16. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. 2 pages. This catalog insert describes the Accr-O-Meter tensile tester made by Scott Testers, Inc., which in conjunction with a Honeywell ElectroniK recorder, provides a continuously recorded stress-strain curve for laboratory or production control tensile strength or stretch analysis.

"Sharples Organic Chemicals: Physical Properties." Catalog 54-1. Sharples Chemicals Inc., 1100 Widener Bldg., Philadelphia 7, Pa. 6 pages. The more than 80 products available from the company in commercial, semi-commercial, and laboratory quantities are described in this brochure.

"Report of the Thirty-Eighth National Conference on Weights and Measures, 1953." National Bureau of Standards Miscellaneous Publication 209. From the Government Printing Office, Washington 25, D. C. 116 pages. Price, 40¢. This publication contains the addresses and reports on weights and measures given by representatives who attended the May 19-22 conference. Covered are topics such as automatic packaging machinery, electronic scales, and flour weights; and actions of the conference with regard to recommended methods of sales of anhydrous ammonia and other liquid chemical fertilizers.

"Rubber Blacks." Binney & Smith Co., 380 Madison Ave., New York 17, N. Y. 1 page. This chart, heat-sealed between two layers of transparent film and punctured to permit hanging on a wall, presents the physical properties of various Columbian carbon blacks and their effects on some natural and GR-S rubber formulations.

"The Institute of Environmental Equipment Manufacturers." Institute of Environmental Equipment Manufacturers, New York 7, N. Y. 24 pages. The Institute's activities, membership classifications, publications, and science contest are described in this brochure.

"Hycar Latex Newsletter." Issue No. 6. B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 6 pages. This publication covers Hycar 1500X207, a new latex; freeze-thaw stability of Hycar latices; and the pH adjustment of Hycar latices.

"Chronological List of Technical Papers from the Government Synthetic Rubber Program." DRP-5-S1. Office of Synthetic Rubber, Reconstruction Finance Corp., Washington 25, D. C. 11 pages. Technical information on government sponsored synthetic rubber research that has been published between January 1 and December 31, 1953, is listed in this bulletin. There have also been published corrected sheets for similar lists covering 1947, 1948, 1951, and 1952 (total pages, 7).

"The Story of Hewitt-Robbins—1891 to Now." Hewitt-Robbins, Inc., Stamford, Conn. 28 pages. The growth of the company, highlighting its people, its products, and its policies, is described in this illustrated brochure.

"Bristol Furnace and Oven Control Instruments Carried in Stock." Bulletin No. P1262. Bristol Co., Waterbury, Conn. 2 pages. The temperature ranges and control actions possible with the company's line of pyrometers, thermocouples, and other temperature recording and controlling devices are presented with illustrations in this catalog insert.

"Monawet MO—Wetting Agent & Penetrant." Technical Bulletin No. 212. Mona Industries, Inc., Paterson, N. J. 1 page. Typical properties and applications of this chemical, the sodium salt of di-(2-ethylhexyl)-sulfosuccinic acid, are presented in this publication.

"It Pays off in Profits to Put SPI on Your Payroll: Here's How." Society of the Plastics Industry, 67 W. 44th St., New York 36, N. Y. 12 pages. This pamphlet, intended for consumption by prospective members of the SPI, describes the activities of the Society and how these activities are beneficial to members.

"Tall Oil in Industry." Bulletin No. 13. Tall Oil Association, New York, N. Y. 4 pages. This catalog insert describes many of the chemical reactions possible with tall oil and proposes uses of the oil and derivative materials in the manufacture of plastic resins.

"Jerguson Water Columns." Data Unit No. 232. Jerguson Gage & Valve Co., Somerville, Mass. 2 pages. This catalog insert describes, illustrates, and gives specifications on the water columns, their principle of operation, and their features.

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"Technically Classified Natural Rubber." Natural Rubber Bureau, 1631 K St., Washington 6, D. C. 118 pages. This publication, contained in a loose-leaf binder for easy insertion of subsequent sheets, brings together under one cover information previously published by various sources. The book is divided into three sections: News Sheets, which give relatively current information of a general nature; Users' Information Circulars, which provide data supplementary to the News Sheets; and Miscellaneous Section, which contains reprints of technical articles on classified natural rubber.

"Tommy Gets the Keys." The B. F. Goodrich Co., Akron, O. 32 pages. This four-color cartoon book describes the education of a teen-age driver before obtaining his operating license. Designed for consumption by young persons about to get their drivers' licenses, the publication depicts the safe and the unsafe practices of vehicle operation.

"Alcohols." Booklet F-4731. Carbide & Carbon Chemicals Co., New York 17, N. Y. 54 pages. Intended as a handy reference for those persons concerned with the commercial applications of alcohols, this publication presents the physical properties, uses and suggested applications, test methods, and other pertinent information on the company's 20 available alcohols.

"Current Safety Topics in the Rubber Industry." Vol. 29, 1953. Transactions of the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. 20 pages. The addresses presented in sessions of the Rubber Section at the forty-first National Safety Congress are contained in this publication. For a report on the meeting and a digest of the papers there presented, see our February, 1954, issue, page 632.

Publications of The British Rubber Producers' Research Association, 48-52, Tewin Rd., Welwyn Garden City, Herts, England.

"The Velocity and Temperature Dependence of Rubber Friction." A. Schallamach. No. 179. 7 pages. The velocity of frictional gliding under constant tangential stress is shown to be, in the first approximation, an exponential function of the reciprocal absolute temperature and of the tangential stress. It is suggested that frictional gliding is a rate process.

"The Electronic Spectra of Conjugated Hydrocarbons." W. Moffitt. No. 181. 21 pages. A new method for dealing with problems of electronic structure, successfully applied to ethylene, is adapted to the general treatment of conjugated hydrocarbons.

"Some Calculations on the Ethylene Molecule." W. Moffitt and J. Scanlan. No. 182. 23 pages. A new treatment of the structure of both planar and twisted forms of ethylene is given, with attention focused on the unsaturation electrons. Results obtained are uniformly better than those of previous calculations.

"Degradation of Natural Rubber in Solution in Vacuo." W. F. Watson. No. 183. 14 pages. The non-oxidative degradation of rubber, said to be the main cause of the decrease of viscosity of rubber solutions in storage, is studied as to rate of degradation and energy of activation for degradation.

"Surface Condition and Electrical Impedance in Rubber Friction." A. Schallamach. No. 184. 9 pages. In frictional gliding of a thin layer of electrically conductive rubber in contact with the track a deformation occurs which considerably increases the electrical impedance of this layer, according to the experimental evidence presented in this booklet.

"The Use of Radioactive Sulphur (S35) in a Study of the Oxidation of Cyclohexyl Methyl Sulfide with Tert.-Butyl Hydroperoxide." G. Ayrey, D. Barnard, and C. G. Moore. No. 185. 5 pages. The irreversibility of the primary oxidation step in the conversion of the sulfide into the corresponding sulfoxide is demonstrated.

"Non-Destructive Examination of Flat Bonded Rubber Mountings." D. M. Heughan and D. O. Sproule. No. 186. 11 pages. The application of ultrasonic techniques to the detection of flaws inside flat bonded rubber mountings is discussed in this paper.

"Non-Linearity in the Dynamic Properties of Vulcanized Rubber Compounds." W. P. Fletcher and A. N. Gent. No. 187. 16 pages. Described in this publication are measurements of the dynamic properties of rubber loaded with various amounts of filler and subjected to mechanical vibration in simple shear at amplitudes from 0-3% shear in the frequency range of 20-120 cycles per second.

"The Autoxidation of 2:6-Dimethylhepta-2:5-Diene." L. Bateman and A. L. Morris. No. 188. 8 pages. This reaction, which proceeds extremely readily and displays kinetic characteristics appreciably different from those of other olefins previously examined, is studied, and conclusions are made as to the reason for the difference.

Publications of Goodyear Tire & Rubber Co., Akron, O.: **"Design Ideas Proved Successful with Pliobond."** 4 pages. Thirteen design applications for this all-purpose adhesive are described and illustrated in this folder.

"Pliovic Vinyl Resins." 50 pages. Contained in this booklet is a comprehensive review of all phases of Pliovic usage including compounding, processing, product applications, recommended formulations, physical properties, etc., and a discussion of the future outlook for vinyl resins.

"Recommended Revision of Treading Automobile and Truck Tires, Commercial Standard CS108-43." TS-5197. Office of Technical Services, United States Department of Commerce, Washington 25, D. C. 12 pages. Being submitted to producers, distributors, and users for written acceptance prior to promulgation is this revision of the Commercial Standard recommended by National Association of Independent Tire Dealers, Inc., and endorsed by the Standing Committee. The existing standard was established in 1943 under wartime conditions, and the revisions now under consideration were impractical at that time.

"Manual of Excellent Managements: 1954 Edition." American Institute of Management, 125 E. 38th St., New York 16, N. Y. 96 pages. This very informative book on company management in the United States and Canada presents the results of a year's study of some 4,000 businesses, listing 348 organizations that are considered excellently managed. Among these are Firestone Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., United States Rubber Co., Archer-Daniels-Midland Co., Celanese Corp. of America, Dow Chemical Co., E. I. du Pont de Nemours & Co., Inc., Durez Plastics & Chemicals, Inc., Hercules Powder Co., Interchemical Corp., Mathieson Chemical Corp., Monsanto Chemical Co., Pennsylvania Salt Mfg. Co., and Union Carbide & Carbon Corp. Other features of the publication which should be of wide interest are listings of those excellently managed companies with outstanding earnings growth capacity, including ratings of 10-year percentage growth in net income and 10-year average percentage return on book, net asset, or liquidating values; and those companies with records of uninterrupted annual cash dividends.

"Jordan Chemicals—Alubragum." W. H. & F. Jordan, Jr., Mfg. Co., Inc., Philadelphia, Pa. 8 pages. This brochure describes the company's line of Alubragums, water soluble synthetic resins, which are used in the rubber industry as latex thickeners. Consisting of sodium and potassium polyacrylate, the compounds are presented with their properties and applications.

"Time-It—The Modern Electric Stopwatch." Bulletin No. 646. Precision Scientific Co., Chicago, Ill. 1 page. Two models of the company's redesigned stopwatches are described and illustrated in this catalog insert.

"Conveyor and Elevator Belting: Splicing and Repair." The B. F. Goodrich Co., Akron, O. 32 pages. This illustrated manual describes how to splice and repair belting, and includes step-by-step photographs, detailed instructions on on-the-job vulcanization by means of portable vulcanizers, etc.

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Cartridge Respirator

(Continued from page 117)

The dust protection feature of the respirator results from a special filter made of charged, resin-treated felt which promotes electrostatic retention of dust particles and supplements the mechanical filtering action. The chemical cartridges that handle the vapors are available with a variety of contained materials to protect against specific breathing hazards.

Italy

(Continued from page 104)

The law mentioned above was found to apply with sufficient approximation to the dynamometric parameters, and since the values for the activation energy derived from them were found to be of the same order of magnitude as those obtained with T-50, the same correlation diagram is applicable—hence adding to its practical value.

Finally, the fairly good agreement between the value for activation energy obtained with the T-50 test and that from stress-relaxation tests reveals an intimate correlation between the two apparently very different phenomena, thus adding a new element to the complex study of relaxation.

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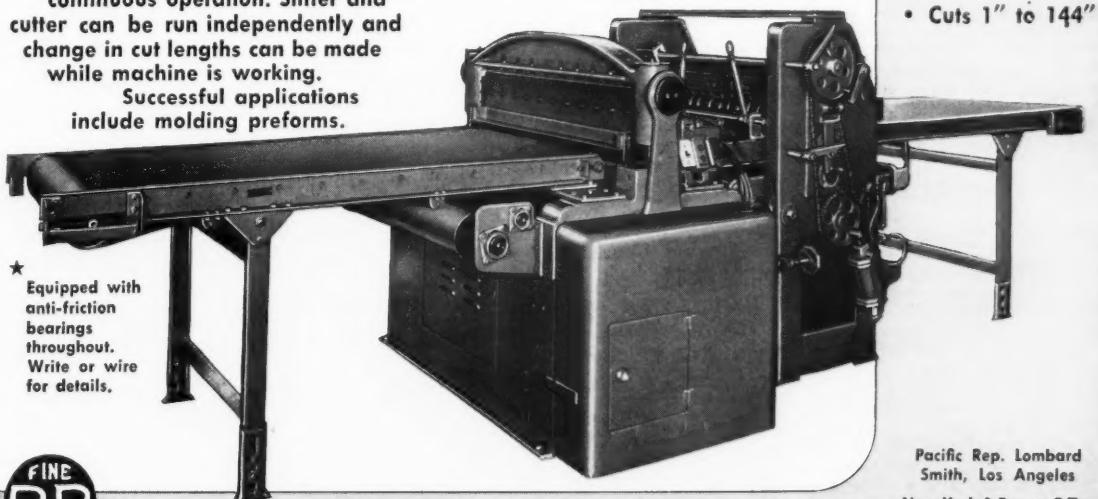

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MARKET REVIEWS

RUBBER

NATURAL rubber prices on both the spot and futures markets moved through a wide range during the period from February 16 to March 15. Prices fell quite sharply during the second half of February and the first week of March as buyers concentrated on the lower grades and showed a tendency to await further price declines. A sharp upswing in demand took place at the end of the period and prices recovered to end at levels higher than those at the start of the period.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Dec. 26	Jan. 30	Feb. 20	Feb. 27	Mar. 6	Mar. 13
R. S. S.: #1	20.63	20.25	20.00	19.88	19.63	20.13
2	20.25	19.88	19.63	19.50	19.38	19.88
3	19.88	19.63	19.50	19.38	19.25	19.75
Latex Crepe						
#1 Thick	25.88	24.38	24.00	23.88	23.75	23.88
Thin	22.88	22.25	22.25	22.13	22.13	22.50
#3 Amber Blanket	18.00	17.38	17.63	17.50	17.63	18.13
Thin Brown Crepe	17.50	16.63	16.63	16.50	16.63	17.03
Flat Bark	16.00	15.25	15.00	15.00	14.88	15.10

No. 1 Ribbed Smoked Sheets started the period at 20.13¢, fell to a low of 19.63¢ on March 5 and 8, then recovered to close at a high of 20.25¢ on March 15. Corresponding price movements took place for the other grades, although price differentials narrowed as the lower grades showed sharper recoveries at the end of the period. February monthly average spot prices for certain grades were as follows: #1 R.S.S., 20.13¢; #3 R.S.S., 19.50¢; #3 Amber Blankets, 17.50¢; and Flat Bark, 15.09¢.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures	Dec. 26	Jan. 30	Feb. 20	Feb. 27	Mar. 6	Mar. 13
May	20.25	20.15	19.75	19.60	19.40	19.80
July	20.25	20.15	19.75	19.65	19.40	19.65
Sept.	20.30	20.20	19.75	19.75	19.40	19.71
Dec.	20.35	20.15	19.80	19.70	19.42	19.70
Mar. '55	20.35	20.15	19.80	19.75	19.60	19.70
Total weekly sales, tons.	230	2,640	780	1,110	1,560	1,280

Futures prices followed the lead of the spot market; May futures started the period at 19.90¢, fell to a low of 19.35¢ on March 8, and closed at a high of 20.10¢ on March 15. Sales during the second half of February amounted to 1,600 tons, making a total for the month of 3,120 tons. Sales for the first half of March were 3,620 tons.

Latex

A FIRMING tendency continued to be noted in the latex market during the period from February 16 to March 15. Prices for natural latex have strengthened, and differentials for both short- and long-term contracts are higher than those prevailing during the second half of 1953. Consumption of natural latex through the first half of this year is expected to average slightly more than 6,000 tons a month. Imports during this period are expected just about to keep pace with consumption, so that a good balance between supply and demand appears likely.

Any sharp increase in domestic demand for natural latex, such as has occurred in the past, will give rise to a tight market since additional production can only be obtained by utilizing more costly field latex and expanding shipping port storage facilities. Another complication is the fact that price differentials for *Hevea* latex in Europe are higher than those prevailing here, so that diversion of latex from Continental usage can be accomplished only by higher prices to domestic consumers.

Final December and yearly totals for 1953 and preliminary January, 1954, domestic statistics for natural and synthetic latices are given in the following table:

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Consumption	Month-End Stocks
Natural latex				
Dec.	0	7,168	5,395	13,532
Total 1953*	0	75,511	67,375	13,532
Jan.†	0	4,500	6,106	12,439
GR-S latices				
Dec.	3,890	10	3,475	4,794
Total 1953*	46,366	1,746	46,473	4,794
Jan.†	4,089	0	3,575	5,114
Neoprene latex				
Dec.	636	0	574	1,117
Total 1953*	9,026	0	7,981	1,117
Jan.†	592	0	595	1,007
Nitrile latices				
Dec.	490	0	277	721
Total 1953*	5,844	0	3,654	721
Jan.†	471	0	284	748

*All yearly totals subject to year-end adjustment.
†Preliminary.

SCRAP RUBBER

THERE were no new developments in the scrap rubber market picture during the period from February 16 to March 15. Trading continued on the slow side, with orders for scrap received from reclaimers for March delivery said to be at about the same level as for the preceding month. Some dealers were reported to be having difficulty in meeting one reclaimer's requirement that mixed auto tire shipments contain a minimum of 40% truck and bus tires.

The only price change that occurred during the period was for red auto tubes, which dropped from 9.5 to 9¢ per pound. Following are dealers' selling prices for scrap rubber, in carload lots; delivered to mills at the points indicated:

	Eastern Points	Akron, O
	(Per Net Ton)	
Mixed auto tires	$11.00	$12.00
S. A. G. auto tires	Nom.	Nom.
Truck tires	Nom.	15.00
Peelings, No. 1	40.00/41.00	40.00/42.00
2	Nom.	24.00
3	14.00/15.00	Nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.50	2.50
Black	4.25	4.50
Red	9.00	9.00
Butyl	1.75	2.00

RECLAIMED RUBBER

THE only development in the reclaimed rubber market during the period from February 16 to March 15 was a slight pick-up in demand that became evident during the first half of March. This demand was centered almost entirely in the reclaim grades made from scrap tires.

The outlook for improved business remains cloudy, being dependent on the expected arousal of the automotive industry which, through the middle of March, failed to materialize. Another source of improvement may result from the work of one reclaimer who is conducting an active program to develop new reclaim-containing products that can replace plastics in certain industrial applications.

Final December and yearly totals for 1953 and preliminary figures for January on the domestic reclaimed rubber industry are now available, as follows:

(All Figures in Long Tons)

	Dec.	Year, 1953*	Jan.†
Production	21,208	295,550	19,741
Imports	255	2,786	194
Consumption	18,858	282,050	19,166
Exports	1,031	11,597	1,059
Stocks	32,319	32,319	32,233

* All totals subject to year-end adjustments.
† Preliminary.

There were no changes in reclaim prices during the period, and current prices follow:

Reclaimed Rubber Prices

	Lb.
Whole tire: first line	$0.10
Fourth line	.0875
Inner tube: black	.15
Red	.21
Butyl	.125
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

COTTON FABRICS

FAIRLY substantial quantities of hose and belting ducks were sold during the period from February 16 to March 15. Most sales were for April and May deliveries, and the increase in demand was said to be due in part to a better volume of export business. Prices of hose and belting ducks were firm and, in view of the steady rise in raw cotton costs, can be expected to increase if the demand trend continues.

On the other hand, an easier price tone was evident in wide industrial fabrics as price concessions were made by some mills. These price declines came as a surprise in view of the limited volume of business and the continued strength of raw cotton prices. Throughout the period sales of wide industrial fabrics amounted to only small fill-in lots for quick delivery.

A little activity was noted in headlinings where the automotive industry was reported to be making purchases for delivery through April. Moderate yardages of some wide sheetings were said to have been sold at current price levels, despite the softening prices in other wide goods.

Cotton Fabrics

Drills		
59-inch 1.85-yd.	*yd.*	$0.36
2.25-yd.		.31
Osnaburgs		
40-inch 2.11-yd.	*yd.*	.24 / $0.245
3.65-yd.		.1575

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Millex	40
Burgess Antisun Wax	**4**
Stearic Acid	1
Age Rite Resin D	1
Age Rite White	0.5
Zinc Oxide	15
Whiting (Water Ground)	50
Burgess Iceberg Pigment	**15**
Burgess Pigment #20	**60**
Sulfur	2
Litharge	5
M.B.T.S.	1
Zimate	1
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A water-washed Kaolin type pigment for natural and synthetic rubber compounding produced by carefully controlled steps—provide a pigment of highly uniform particle size, constant pH, excellent color and maximum freedom from impurities. Tests showed:

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2.00-yd. D. F.		$0.30⅜
51.5-inch, 1.35-yd. S. F.		.46⅝
Hose and belting		.64
Raincoat Fabrics		
Printcloth, 38½-inch, 64x60	yd.	.1325 / $0.135
Sheeting, 48-inch, 4.17-yd.		.20 / .2025
52-inch, 3.85-yd.		.22
Chafer Fabrics		
14.30-oz./sq. yd. Pl.	lb.	.71
11.65-oz./sq. yd. S.		.63
10.80-oz./sq. yd. S.		.6675
8.9-oz./sq. yd. S.		.68
Other Fabrics		
Headlining, 59-inch, 1.65-yd., 2-ply	yd.	.47
64-inch, 1.25-yd., 2-ply		.60
Sateens, 53-inch, 1.32-yd.		.54 / .545
58-inch, 1.21-yd.		.59

RAYON

TOTAL shipments of all types of rayon by domestic producers during February amounted to 80,900,000 pounds, a slight drop from the January figure of 81,500,000 pounds. Of these totals, shipments of high-tenacity rayon yarn to domestic and foreign consumers, respectively, were as follows: January, 30,000,000 and 100,000 pounds; and February, 30,400,000 and 300,000 pounds.

Calculated domestic production of all types of rayon was 83,300,000 pounds in January and 75,000,000 pounds in February. Respective calculated productions of high-tenacity yarn for these months were 32,100,000 and 30,400,000 pounds. Month-end stocks of high-tenacity yarn were 15,400,000 pounds for January and 15,100,000 pounds for February. Total rayon stocks amounted to 111,700,000 pounds at the end of January and 105,800,000 pounds February 28.

No changes were made in rayon tire yarn and fabric prices during the period from February 16 to March 15.

Rayon Prices

Tire Yarns		
1100/ 480	$0.26	$0.63
1100/ 490		.62
1150/ 490		.62
1165/ 480		.63
1650/ 720		.61
1650/ 980		.61
1820/ 980		.61
2200/ 960		.60
2200/ 980		.60
2200/1466		.67
4400/2934		.63
Tire Fabrics		
1100/490/2		.72
1650/980/2	.659	.73
2200/980/2		.685

Financial

(*Continued from page 90*)

Okonite Co., Passaic, N. J. For 1953: net profit, $2,360,000, equal to $14.00 a share, against $2,124,000, or $12.59 a share, in 1952; sales, 54,500,000, against $53,145,000.

Parke, Davis & Co., Detroit, Mich. For 1953: net income, $9,344,017, equal to $1.91 each on 4,894,900 shares, contrasted with $16,256,343, or $3.32 a share, in 1952; sales, $109,852,079, against $126,313,461.

Rome Cable Corp., Rome, N. Y. Nine months to December 31, 1953: net profit, $1,259,000, equal to $2.52 each on 498,429 common shares, compared with $1,550,000, or $3.17 each on 485,391 shares, in the 1952 period.

Sun Oil Co., Philadelphia, Pa. Year ended December 31, 1953: net profit, $45,153,602, equal to $5.85 a common share, against $43,013,063, or $6.01 a share, in the preceding year.

Compounding Ingredients—Price Changes and Additions

Accelerator-Activators, Inorganic			
Litharge, Eagle, sublimed	lb.	$0.15 /	$0.151
National Lead	lb.	.15 /	.151
Red lead, Eagle	lb.	.16	
National Lead	lb.	.16 /	.1625
Accelerator-Activators, Organic			
Emersol 210 Elaine	lb.	.1425/	.1775
Groco 53	lb.	.1375/	.155
54	lb.	.1425/	.16
55	lb.	.165 /	.1825
Dusting Agents			
Liquizinc No. 305	lb.	.30 /	.35
Plasticizers and Softeners			
Adipol 2EH, 10A	lb.	.4475/	.4775
BCA	lb.	.45 /	.475
ODY	lb.	.5175/	.5475
Dinopol	lb.	.35 /	.38
Ethox	lb.	.43 /	.455
Kapsol	lb.	.3225/	.3525
KP-23	lb.	.29 /	.32
90	lb.	.45 /	.48
140	lb.	.46 /	.485
201	lb.	.5825/	.5925
220	lb.	.31 /	.34
555	lb.	.3125/	.3375
Kronisol	lb.	.33 /	.355
Kronitex AA, I	lb.	.33 /	.36
Methox	lb.	.385 /	.41
Ohopex Q-10	lb.	.32 /	.35
R-9	lb.	.3525/	.3775

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Belden Mfg. Co.	Com.	$0.40 q.	Mar. 2	Feb. 17
Brunswick-Balke-Collender Co.	Com.	0.12½q.	Mar. 15	Mar. 1
Denman Tire & Rubber Co.	Pfd.	1.25 q.	Apr. 1	Mar. 20
	Com.	0.10	Apr. 1	Mar. 26
Endicott Johnson Corp.	Com.	0.40 q.	Apr. 1	Mar. 18
	4% Pfd.	1.00 q.	Apr. 1	Mar. 18
Faultless Rubber Co.	Com.	0.25 q.	Apr. 1	Mar. 15
Firestone Tire & Rubber Co.	Com.	0.75	Apr. 20	Apr. 5
Flintkote Co.	Com.	0.50 q.	Mar. 10	Feb. 24
	$4.00 Pfd.	1.00 q.	Mar. 15	Mar. 1
Goodall Rubber Co.	Com.	0.15 q.	Feb. 15	Feb. 4
Hewitt-Robins, Inc.	Com.	0.50 q.	Mar. 15	Feb. 23
Johnson & Johnson	Com.	0.35 q.	Mar. 11	Feb. 24
Mansfield Tire & Rubber Co.	Com.	0.25	Apr. 20	Apr. 9
Minnesota Mining & Mfg. Co.	Com.	0.30 q.	Mar. 12	Feb. 26
	Pfd.	1.00 q.	Mar. 12	Feb. 26
National Automotive Fibres, Inc.	Com.	0.50 q.	Mar. 1	Feb. 10
Okonite Co.	Com.	0.50	May 1	Apr. 16
O'Sullivan Rubber Corp.	Com.	0.05 q.	Apr. 15	Apr. 2
	5% Pfd.	0.25 q.	Apr. 1	Mar. 25
Phelps Dodge Corp.	Com.	0.65 q.	Mar. 10	Feb. 25
Plastic Wire & Cable Corp.	Com.	0.15 q.	Apr. 15	Mar. 31
		*	Apr. 15	Mar. 29
Seiberling Rubber Co.	Com.	0.10 q.	Mar. 15	Mar. 1
	4½% Pfd.	1.13 q.	Apr. 1	Mar. 1
	5% Pfd. Cl. A	1.25 q.	Apr. 1	Mar. 1
Sheller Mfg. Corp.	Com.	0.37½ q.	Mar. 12	Feb. 16
United States Rubber Co.	Com.	0.50 q.	Mar. 13	Feb. 23
	8% 1st Pfd.	2.00 q.	Mar. 13	Feb. 23
		2.00 q.	June 12	May 24
Westinghouse Air Brake Co.	Com.	0.40 q.	Mar. 15	Feb. 26

*Stock—10%.

United States Rubber Statistics — December and Year, 1953

(All Figures in Long Tons, Dry Weight)

	December						Yearly Totals					
	New Supply			Distribution			New Supply			Distribution		
	Production	Imports	Total	Consumption	Exports	Month-End Stocks	Production	Imports	Total	Consumption	Exports	Year-End Stocks
Natural rubber and latex, total	0	45,947	45,947	42,400	923	112,316	0	647,150	647,150	553,473	8,376	112,316
Rubber, total	0	38,779	38,779	37,005	923	98,784	0	571,639	571,639	486,098	8,376	98,784
Latex, total	0	7,168	7,168	5,395	0	13,532	0	75,511	75,511	67,375	0	13,532
Synthetic rubbers, total	*50,794 †8,579	1,035	60,408	50,902	2,627	175,845	*746,924 †101,577	12,781	861,222	782,086	22,668	175,845
GR-S types‡	*44,793 †130	979	45,902	40,018	791	135,153	*668,386 †824	11,518	680,728	624,181	7,692	135,153
Butyl	*6,001	56	6,057	4,808	6	24,866	*78,538	1,263	79,801	77,826	237	24,866
Neoprene‡	†6,990	0	6,990	4,836	1,416	11,480	†80,495	0	80,495	64,150	11,494	11,480
Nitrile type‡	†1,459	0	1,459	1,240	414	4,346	†20,198	0	20,198	15,929	3,245	4,346
Natural rubber and latex, and synthetic rubbers, total	59,373	46,982	106,355	93,302	3,550	288,161	848,441	659,931	1,508,372	1,335,559	31,044	288,161
Reclaimed rubber, total	21,208	255	21,463	18,858	1,031	32,319	295,550	2,786	298,336	282,050	11,597	32,319
Grand Totals	80,581	47,237	127,818	112,160	4,581	320,480	1,143,991	662,717	1,806,708	1,617,609	42,641	320,480

*Government plant production.
†Private plant production.
‡Includes latices.
Source: Chemical & Rubber Division, BDSA, United States Department of Commerce, Washington, D. C.

AS MUCH AS

33% LOWER BULKING of PROTOX ...SAVES 3 WAYS

This lower bulking of PROTOX* ZINC OXIDES, stemming from their unique coating of zinc propionate, gives you triple advantages:

1. RELEASES VALUABLE STORAGE SPACE

You can carry larger stocks of raw materials to protect your production schedules.

2. CUTS HANDLING COSTS

Reduces number of load trips within your plant.

Carloads of PROTOX ZINC OXIDES are available in unit loads for convenient handling by fork lift-truck in your plant.

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PROTOX ZINC OXIDES incorporate and disperse rapidly.

PROTOX ZINC OXIDES speed mixing of carbon blacks.

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U.S. Patents 2,303,329 and 2,303,330

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS

U. S. Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	November, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.		
Crude rubber	100,614,207	$20,555,812
Latex	10,809,940	2,621,299
Balata	240,201	56,544
Jelutong or Pontianak	164,314	77,496
Gutta percha	42,944	31,834
Crude chicle	943,014	512,446
Synthetic rubber	1,678,195	447,979
Reclaimed rubber	296,000	22,104
Scrap rubber	2,730,788	140,509
TOTALS	117,519,603	$24,466,023
MANUFACTURED		
Rubber tires		
Auto, etc.....no.	5,752	$153,774
Bicycle.....no.	4,446	3,337
Inner tubes		
Auto, etc.....no.	577	2,424
Footwear		
Boots.....prs.	4,524	10,250
Shoes and overshoes.....prs.	37,097	13,866
Rubber-soled canvas shoes.....prs.	3,594	2,491
Athletic balls		
Golf.....no.	72,600	21,528
Tennis.....no.	44,016	2,883
Other.....no.	35,552	6,854
Toys	.....	29,667
Hard rubber goods		
Combs.....no.	34,608	3,004
Other	.....	255,799
Rubberized printing blankets.....lbs.	1,550	2,820
Rubber and cotton packing.....lbs.	4,438	7,980
Tape, friction....lbs.	200	60
Gasket and valve packing	.....	4,715
Molded insulators	.....	665
Belting.....lbs.	4,867	5,862
Hose and tubing	.....	7,833
Gloves.....prs.	52,440	14,422
Instruments.....doz.	8,599	22,115
Bands.....lbs.	2,797	1,272
Other	.....	640
Gutta percha manufactures.....lbs.	1,315	1,336
Synthetic rubber products	.....	7,096
Other soft rubber goods	.....	166,050
TOTALS	.....	$748,743
GRAND TOTALS, ALL RUBBER IMPORTS	.....	$25,214,766

Exports of Domestic Merchandise

	November, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.		
Chicle and chewing gum bases	515,184	$198,061
Synthetic rubbers		
GR-S types	1,632,040	432,797
Butyl	24,270	5,939
Neoprene	2,587,494	1,158,833
Nitrile type	916,541	465,269
Other	123,135	122,285
Reclaimed rubber	2,432,153	211,935
Scrap rubber	1,684,225	44,361
TOTALS	9,915,042	$2,639,480
MANUFACTURED		
Rubber cement.....gals.	68,244	$145,918
And rubberized fabrics.....sq. yds.	218,749	198,453
Clothing	.....	154,881
Footwear		
Boots and shoes..prs.	15,873	31,937
Rubber-soled canvas shoes.....prs.	19,785	39,054
Heels.....doz. prs.	57,132	68,186
Soles, soling, and topliff sheets....lbs.	736,040	196,192
Gloves and mittens.....doz. prs.	11,686	60,622
Drug sundries	.....	218,269
Toys, balls, novelties	.....	68,618
Hard rubber goods....no.	32,241	44,251
Other electrical goods.....lbs.	183,958	89,014
Other	.....	6,470
Rubber tires and casings		
Truck and bus....no.	61,344	2,754,930
Auto and motorcycle.....no.	70,466	958,153
Aircraft.....no.	2,778	205,310
Off-the-road....no.	10,969	1,182,658
Farm tractor...no.	4,346	165,955
Implement....no.	1,261	36,581
Other.....no.	2,012	24,640
Inner tubes		
Auto.....no.	33,646	70,322
Truck and bus....no.	36,841	152,855
Aircraft.....no.	3,630	17,371
Other.....no.	5,319	32,155
Solid tires		
Truck and commercial.....lbs.	2,071	30,933
Tire repair material		
Camelback.....lbs.	897,111	256,967
Other.....lbs.	306,189	257,580
Tape, except medical and friction.....lbs.	30,560	27,164
Rubber belting		
V-type, vehicle, fan.....lbs.	97,872	112,225
Transmission		
V-type.....lbs.	81,184	152,625
Flat belts....lbs.	54,247	85,492
Conveyor and elevator.....lbs.	164,703	193,193
Other.....lbs.	5,178	9,798
Hose		
Molded and braided.....lbs.	270,762	239,338
Wrapped and hand built.....lbs.	101,115	100,058
Other hose and tubing.....lbs.	64,609	83,692
Packing		
Sheet type.....lbs.	34,740	26,037
Other.....lbs.	140,150	175,225
Tiling and flooring..lbs.	241,589	71,430
Mats and matting..lbs.	261,406	86,555
Thread		
Bare.....lbs.	18,632	29,819
Textile covered..lbs.	16,675	47,243
Compounded rubber for further manufacture.....lbs.	864,710	306,121
Other rubber manufactures	.....	548,031
TOTALS	.....	$9,762,321
GRAND TOTALS, ALL RUBBER EXPORTS	.....	$12,401,801

Reexports of Foreign Merchandise

	November, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.		
Crude rubber	2,479,074	$579,207
Chicle and chewing gum bases	4,499	4,251
TOTALS	2,483,573	$583,458

SOURCE: Bureau of the Census, United States Department of Commerce, Washington, D. C.

Estimated Pneumatic Casings, Tubes, Camelback Shipments, Production, and Inventory, January, 1954; December, 1953; January, 1953

	Original Equipment	Replacement	Export	Total	Production	Inventory
Passenger Casings						
Jan., 1954	2,548,899	3,378,333	58,681	5,985,913	5,251,403	12,279,042
Change from previous month				+27.94%	−2.86%	−5.86%
Dec., 1953	2,263,053	2,339,569	76,049	4,678,671	5,405,748	13,043,713
Jan., 1953	2,563,419	3,915,914	33,090	6,512,423	6,824,097	11,287,880
Truck and Bus Casings						
Jan., 1954	341,949	614,964	58,836	1,015,749	1,048,082	2,697,796
Change from previous month				+2.82%	−2.52%	+0.81%
Dec., 1953	357,105	563,405	67,390	987,900	1,075,215	2,676,230
Jan., 1953	440,465	877,945	50,858	1,369,268	1,413,890	2,829,636
Total Automotive Casings						
Jan., 1954	2,890,848	3,993,297	117,517	7,001,662	6,299,485	14,976,838
Change from previous month				+23.56%	−2.80%	−4.73%
Dec., 1953	2,620,158	2,902,974	143,439	5,666,571	6,480,963	15,719,943
Jan., 1953	3,003,884	4,793,859	83,948	7,881,691	8,237,987	14,117,516
Tractor—Implement Casings						
Jan., 1954	156,917	108,208	4,482	269,607	203,726	759,223
Change from previous month				+31.26%	+3.67%	−17.64%
Dec., 1953	135,361	63,745	6,289	205,395	196,520	921,811
Jan., 1953	274,849	138,555	3,398	416,802	413,157	865,417
Passenger, Motorcycle, Truck and Bus Inner Tubes						
Jan., 1954	2,883,946	3,892,438	57,613	6,833,997	5,395,155	10,107,488
Change from previous month				+47.77%	+19.03%	−12.59%
Dec., 1953	2,620,140	1,917,424	87,339	4,624,903	4,532,718	11,563,721
Jan., 1953	3,012,081	4,522,761	49,089	7,583,931	6,195,273	10,284,273
Camelback (Lbs.)						
Jan., 1954	—	20,497,860	649,939	21,147,799	21,876,648	26,745,563
Change from previous month				−23.67%	−16.75%	+3.41%
Dec., 1953	—	26,612,704	1,092,332	27,705,036	26,278,438	25,864,392
Jan., 1953	—	24,348,800	674,240	25,023,040	26,797,120	24,189,760

NOTE: Data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Carbon Black Statistics—Fourth Quarter and Year, 1953

Below are statistics for output, shipments, producers' stocks, and exports of carbon black for the fourth quarter and year, 1953. Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast extruding furnace black; and HAF, high abrasion furnace black.

(Thousands of Pounds)

	Oct.	Nov.	Dec.	1953 Total
Production:				
Furnace types				
Thermal....	9,363	8,712	9,777	106,750
SRF.....	21,884	23,187	23,203	270,420
HMF.....	7,843	6,709	8,225	105,990
FEF.....	15,917	15,561	14,726	213,095
HAF.....	35,654	32,107	34,279	460,965
Total.....	90,661	86,276	90,210	1,157,220
Contact types.	35,699	34,989	34,454	454,258
TOTALS.....	126,360	121,265	124,664	1,611,478
Shipments:				
Furnace types				
Thermal....	7,976	7,247	8,907	97,753
SRF.....	20,554	19,624	20,609	271,720
HMF.....	8,075	7,962	8,244	112,683
FEF.....	14,718	13,634	13,373	196,396
HAF.....	33,738	29,776	32,348	427,985
Total.....	85,061	78,243	83,481	1,107,037
Contact types.	33,450	35,368	39,510	454,838
TOTALS.....	118,511	113,611	122,991	1,561,875
Producers' Stocks, End of Period:				
Furnace types				
Thermal....	9,945	11,410	12,280	12,280
SRF.....	23,556	27,119	29,713	29,713
HMF.....	28,686	27,433	27,414	27,414
FEF.....	34,597	36,524	37,877	37,877
HAF.....	59,152	61,483	63,414	63,414
Total.....	155,936	163,969	170,698	170,698
Contact types.	239,182	238,803	233,716	233,716
TOTALS.....	395,118	402,772	404,414	404,414
Exports:				
Furnace types.	13,741	11,586	16,840	163,987
Contact types.	11,680	14,474	22,453	194,633
TOTALS.....	25,421	26,060	39,293	358,620

SOURCE: Bureau of Mines, United States Department of the Interior, Washington 25, D. C.

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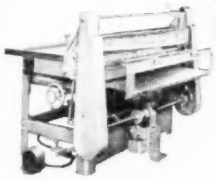
Write for literature on any or all of these shears. No obligation.



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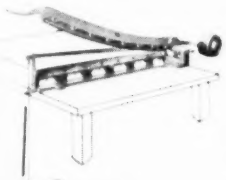

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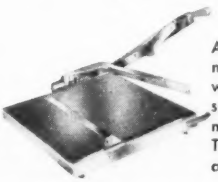

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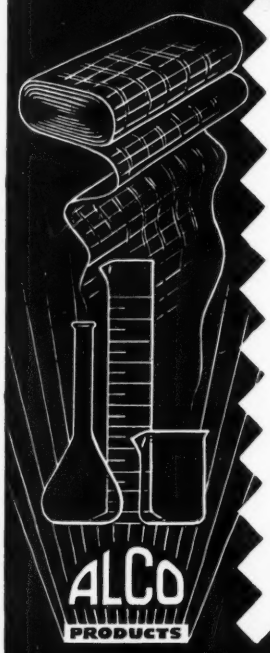

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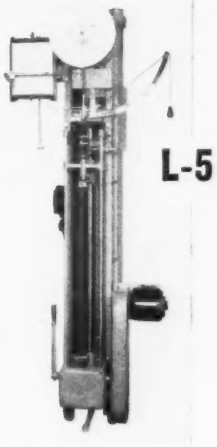
This low-cost tester for rubber fulfills ASTM, Government and UL requirements. It is supplied as a single-purpose machine with one speed, one pair of clamps and a single capacity. In ordering, you have a choice of various capacities up to 200 lbs. or 68 kilograms. It can be furnished with spark recorder, and has quick-return moving clamp. Speed of pull is 20″ per minute.

WHERE THE L-5 IS PREFERABLE —

Model L-5 is a heavier, much more versatile tensile tester, which can be operated at a wide range of speeds, is adjustable for various capacities up to 500 lbs. or 136 kilograms tensile, and can use various clamps interchangeably. This is the machine to order for detailed information on a variety of elastomeric evaluation problems. Computes tensile strength per cross section area, and elongation percent.



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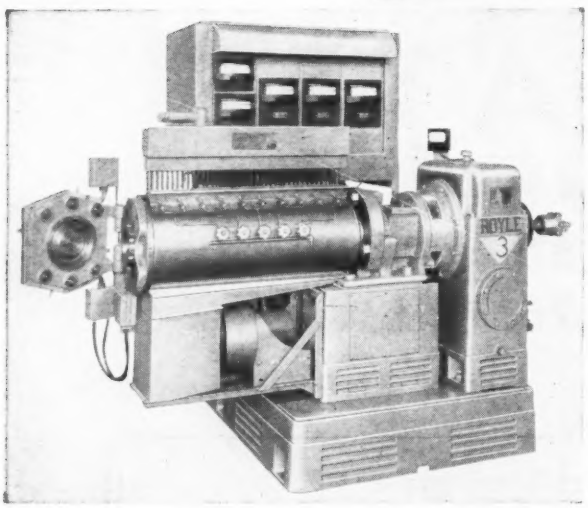

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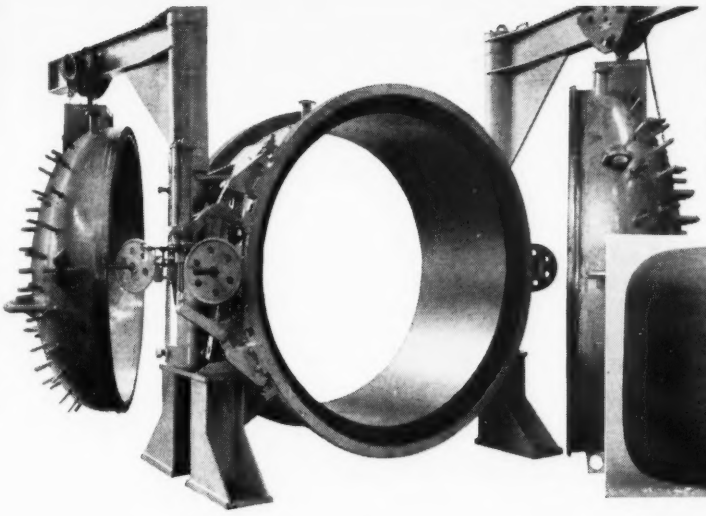

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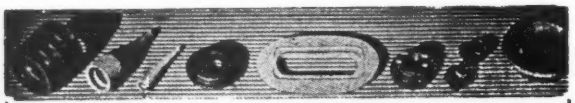

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The customers of the Sid Richardson Carbon Co. need not worry about the continual diversion of natural gas from channel plants to pipe lines. With our own extensive supplies of natural gas and other resources, plus the world's largest channel black plant, we can assure you a constant supply of top-quality uniform, economical-to-use ***TEXAS "E"*** and ***TEXAS "M"*** channel blacks.

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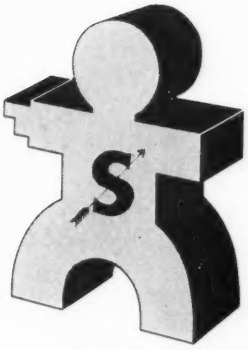
scrap rubber

plastics



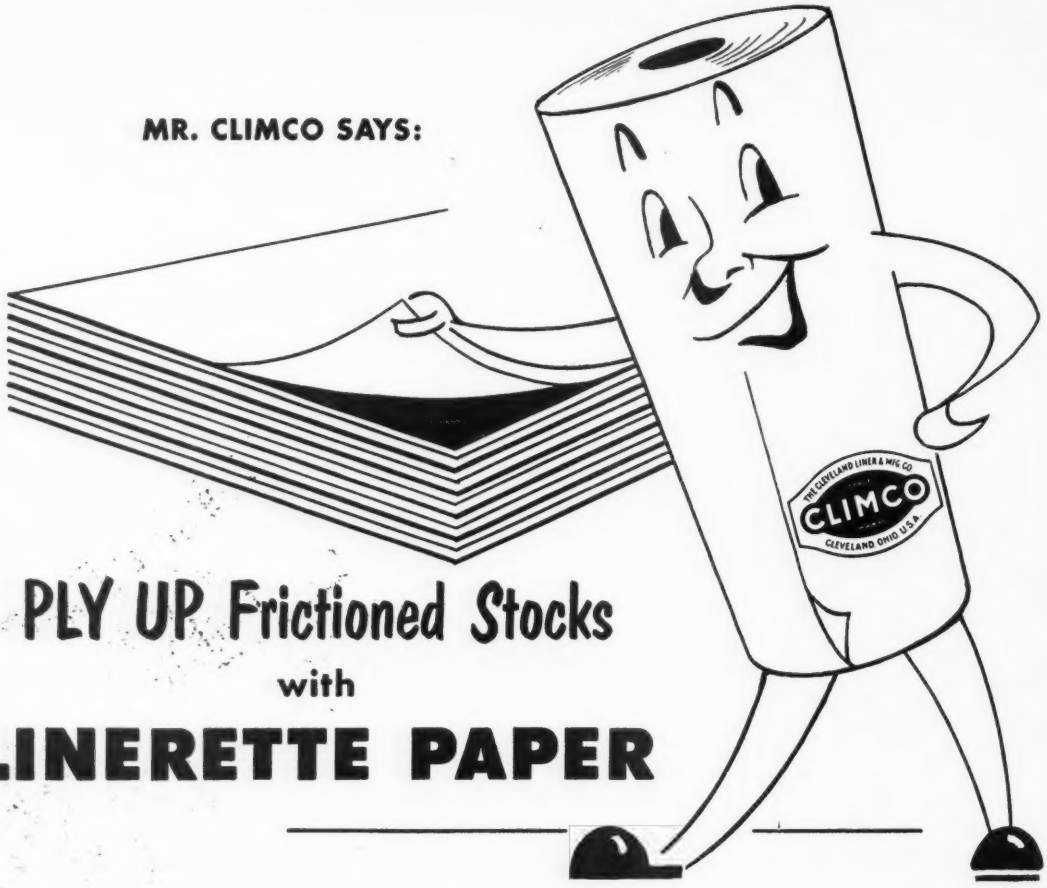
crude rubber

hard rubber dust

A. Schulman Inc.

our 25th year

MR. CLIMCO SAYS:



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